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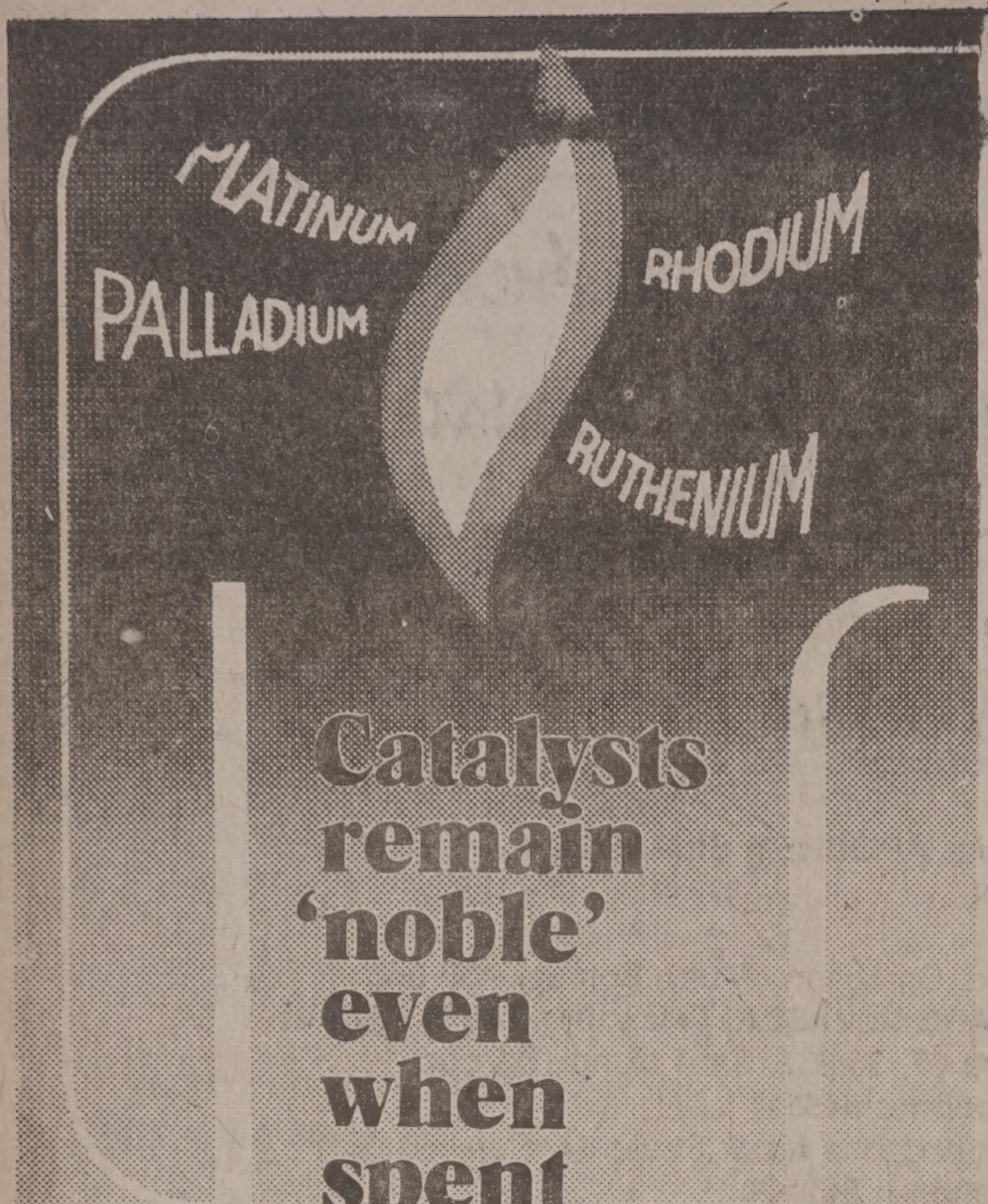

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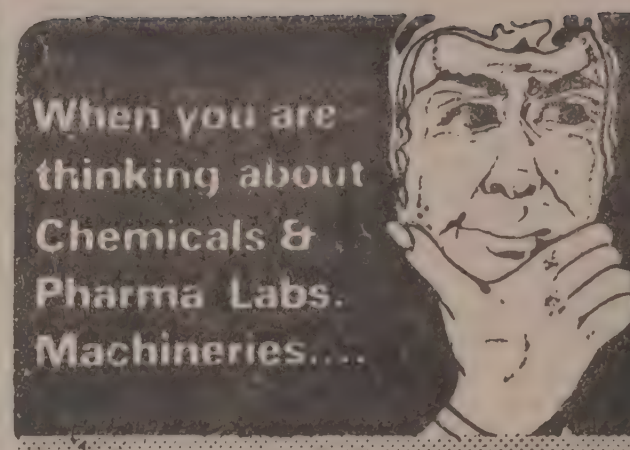

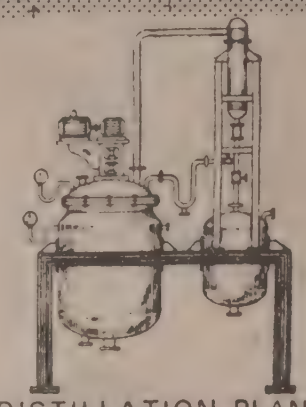
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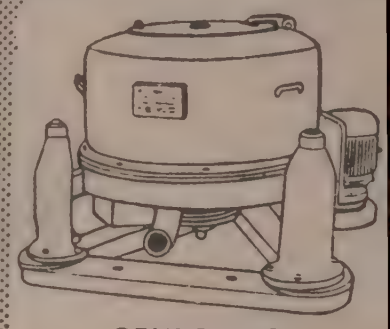
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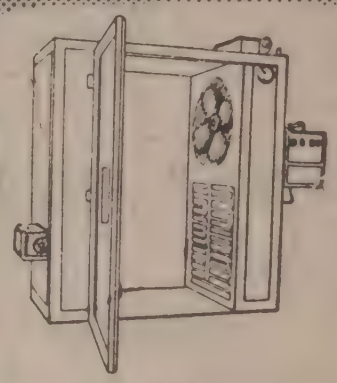
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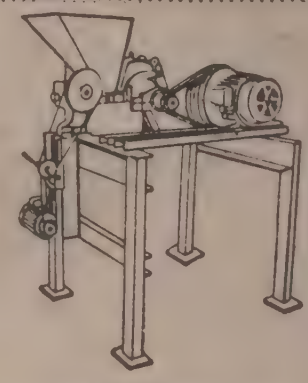
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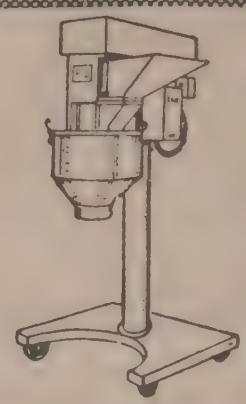
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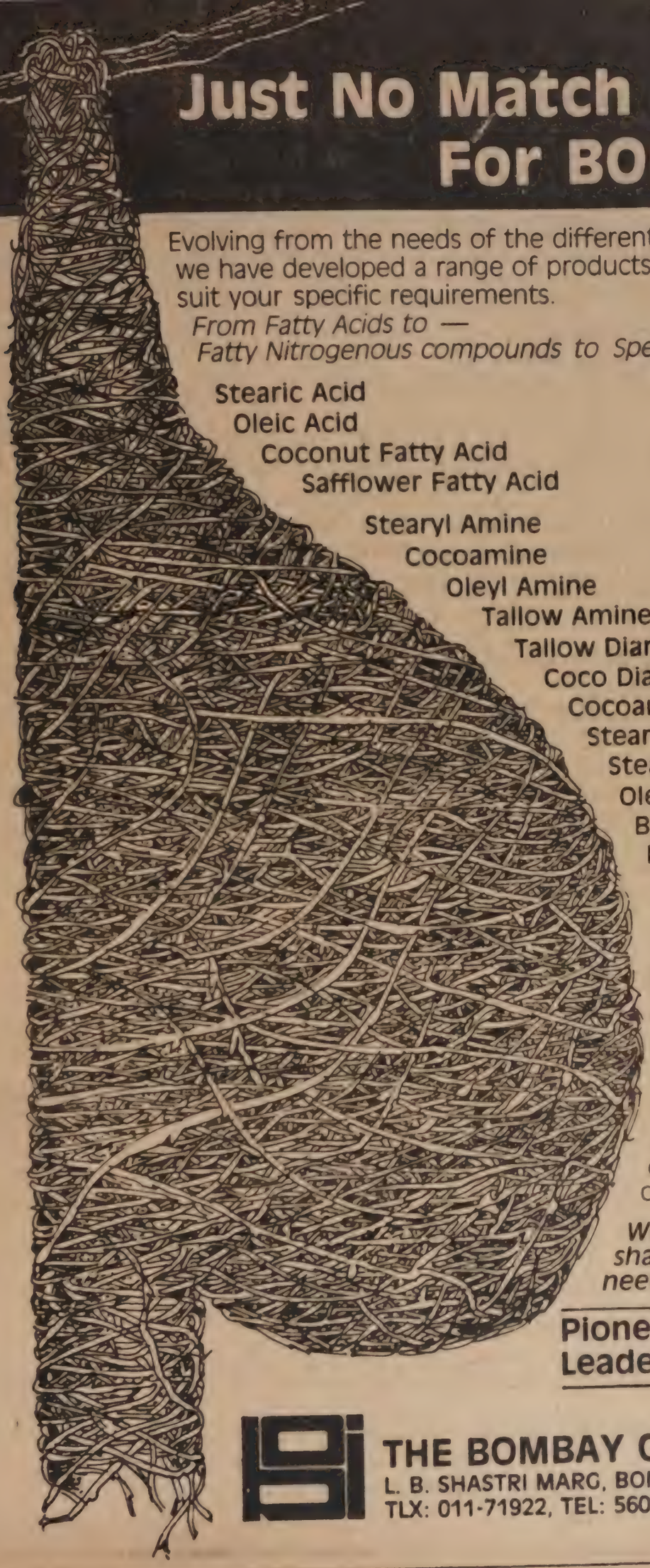

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CHEMICAL WEEKLY

VOL. XXXV JANUARY 23, 1990 NO. 20

HERALDING THE 21st CENTURY - 35

The Future of Medical Technology & Treatment

Important trends that are emerging in regard to new and future medical technologies are:

1. An explosive increase in knowledge about the biology of disease, the environment, bodily functions and new treatments;
2. Faster diagnosis and treatment, increasingly moving beyond control of symptoms to interventions that will prevent symptoms;
3. An ever larger attention to the costs of health care in choices of treatment and in development of new technologies, resulting in an important role for technology assessment;
4. Growing capability to maintain basic bodily functions technologically, when neurological control is degraded or almost entirely absent;
5. A proliferation of techniques to assist, control, or avoid reproduction; and
6. Growing ability to evaluate, diagnose, and give medical or surgical treatment to the fetus in the womb.

Earlier and More Effective Diagnosis, Intervention, and Prevention: Intervention in the disease process can vary from consumer education on diet and lifestyles, to genetic engineering and drug therapy. The shift from controlling symptoms to more positive intervention is the result of a circular interaction between new scientific knowledge, new instruments, and treatment enabling technologies that in turn produce further knowledge. Earlier diagnosis and prevention of disease are of particular importance in approaches to chronic illnesses, which constitute the major illness burden in industrialized nations. They will, however, also affect acute illnesses in which genetic, behavioural and environmental factors can be identified.

Prevention of disease itself carries a potential for clashes between the general welfare and the assertion of individual rights, as illustrated by AIDS containment and crusades against tobacco use.

Self-Care: New technologies, while causing some of this rapid increase in costs, also enable more people to take care of themselves when ill, thus potentially reducing health care costs. Home based computers linked with diagnostic-treatment centers or implanted microchips for sensing body conditions and for release of drugs, could for example make possible self-administered chemotherapy treatment of cancer. Intravenous physical and respiratory therapy and monitoring of chronic disease could take place in the home.

A strong trend toward self-diagnosis, self-care, and home-care techniques has been evident for some time. Pregnancy test kits, kits for testing or measuring urine sugar content, and consumer instruments for monitoring blood pressure have already become familiar. Further home diagnostic tests are being developed. Implantable time-released medication is already in use for some conditions. Some experts anticipate the development of "hospitals on the wrist." i.e., wearable devices that monitor certain body functions and make chemotherapeutic and electromagnetic adjustments as necessary.

Implants of microchips and biochips may in the future allow better monitoring of bodily functions, regulate drug delivery devices, redress defective sight or hearing, and provide neural control of damaged limbs. Some scientists hope that eventually "biological machines" could be implanted to repair human tissue and organs.

Advances in biological and non-biological materials and in microelectronics hold the promise of significant advances in related technologies, such as the following:

* programmable implantable medication systems including infusion pumps, for use in treatment of such problems as diabetes and cardiovascular disease; some are now in clinical trials;
* implanted electrodes and brain peptide releasers, for treatment of depression, propensity to aggression, and other emotional disorders;
* implanted electronic hearing aids;
* cerebellar pacemakers for control of epilepsy, chronic pain, schizophrenia, and violent behaviour;
* automatic defibrillators for assisting damaged hearts; and
* artificial visual implants or assists and image enhancers for the visually impaired.

Pharmaceuticals: Breakthroughs in pharmaceutical products and delivery systems promise radically different medical treatments for many illnesses. Drugs are being developed that act closer to the disease site and are specific to the damaging side effects of older untargetted treatments. Entirely new

types of therapeutic agents are being developed, some both more potent and more natural to the body than conventional pharmaceuticals. Some possibilities are:

* *Immunomodulators* — These maintain proper functioning of the immune system, without the problems associated with current cell-killing drugs. New treatments would involve the use of natural substances such as interferon, to modify specific functions in the body. These immunomodulators will be used, first, as therapy for immune deficiency diseases and to suppress the immune system for grafting and transplanting organs, then to enhance the natural killer cells to attack new cancers and other diseases.

* *Neurotransmitters* — Scientists are becoming more familiar with the activities of these materials and new and more effective treatments should follow for Parkinson's disease, Alzheimer's disease, amyotrophic lateral sclerosis (ALS) Huntington's disease and mental diseases caused by neurotransmitter deficiencies. Some pharmaceuticals to enhance or prolong memory are already being tested.

* *Neurotrophic hormones* — It is hoped that neurotrophic hormones may stimulate growth in dying nerve cells that produce the transmitters. Research to identify neurotrophic hormones will probably be followed by large-scale synthesis and treatment. Drugs capable of penetrating the blood-brain barrier could treat loss of function in the neocortex due to severe head injury.

* *Mood-altering drugs* — These drugs have been found to exist naturally in the body as a class of compounds made up of endorphins and enkephalins. Many functions have been attributed to these materials including acting as a pain-blocking analgesia, tranquilizer, and antidepressant. Opiate blockers can be used to modify such behaviours as over eating and aberrant sex drives. These substances, being natural to the body, may not be addictive and may eliminate the side effects of current ''mood elevator'' and other drugs.

* *Monoclonal antibodies* — These products of genetic engineering have opened up a wealth of new therapeutic possibilities, such as cancer chemotherapy in which the cell-killing drugs would attack only the cancer-causing cells in the body. Toxic chemicals attached to the antibodies would then seek out cancerous cells before being activated. Monoclonal antibodies may also be used to kill donor cells that cause lethal conditions in bone marrow transplantations. They can be made to react with infectious bacteria against which antibiotics have not been successful. They can be designed to behave as enzymes, catalyzing chemical reactions and opening up the possibility of unlimited diversity in specific-acting enzymes.

* *Prostaglandins* — A natural substance in the body, synthesized prostaglandins can be used as anticlotting agents useful in heart bypass surgery, prevention of heart attacks through clot prevention, and treatment of asthma, ulcers and inflammation.

* *Vaccines* — Synthetic vaccines that confer multiple protection could be used for influenzas, viruses that cause cold sores, genital herpes, chicken pox, etc., could be attacked with new vaccines.

New delivery systems may have nearly as mom effects on medical care as new pharmaceuticals them do. Especially important will be the controlled rele drugs at dosages and times that are needed. New ma used for coating will release drugs at a constant rate th degradation, permeable membranes and electric ch Magnetic systems can be used for pulse-released drug as immunosuppressants for transplant patients and imp pumps will deliver precise dosages for treatment of c and for delivery of insulin. Dosages can be altered with and, as equipment becomes smaller and simpler, can be by patients to provide their own chemotherapy at h Another form of delivery system will be sprays.

Reproduction Technologies: For those wishing to have dren, the possibilities of technological help have recently greatly increased. These new assists are not always suc ful, and many carry significant risks and high costs. include fertility drugs; artificial insemination using the s of the husband, a selected partner, or an unknown donor in-vitro fertilization using either both parents' germ ce donated eggs and/or semen, with implantation in the u of either the biological mother or a surrogate mother. Sp freezing techniques permit an increase in the numbe donors and theoretically make possible the selection of cific genetic characteristics for the babies. Frozen emb have increased the ease and success rate of in vitro fe zation and implantation,but raised ethical issues regarding use of ''excess'' or left-over embryos. For those wishin curtail production of a family, technologies will also vide choices: injectable contraceptives, a contraceptive cine, intra-uterine devices for preventing embryo implana and non-surgical sterilization. These ''technologies at beginning of life'' promise to raise a number of serious stitutional issues.

Science fiction abounds with stories about chimeras clones. Chimeras are animals with the genes — and c acteristics of two H or more species; in Greek mythol the chimera was a beast that had the head of a lion, the b of a goat and the tail of a serpent. Clones are animals g etically identical to a parent, i.e. reproduced asexually, c a sibling (when an early stage embryo is divided and re planted). These have until recently been considered in class of fairy tales. But large animals such as valuable ca are now produced in multiple identical copies by remov a fertilized egg after two cell divisions, dividing it and all ing each fragment to begin cell reproduction again, implanting each new embryo in the womb of a less valua brood cow. Chimeras have been developed by placing eign genes in animals as complex as mice. A series of exp iments have produced healthy chimeric mice by implant in the uterus of a mouse, differentiated cells found in tum The interesting issue here is that what were thought to undifferentiated cells in a tumor, actually contained a v ety of tissues-tooth, bone, gland, etc. — from which co be grown an entire animal. It now appears unlikely that hur clones or chimeras will be developed, although the barr are in the long-run apt to be ethical and political rather t technical. The evolution of this capability could neverthel result in production of body tissues, or new body parts, at least in theory could allow unisex pregnancy and ch bearing, even by males.

— T.P.S. RAJ

(Source: Biology and Bill of Rights Special Report, OT

CHEMARENA

.L. VENKITESWARAN

Recycling of Plastics

Recycling of plastics from wastes is slowly building up to a big business, largely as a result of the compulsions f the concern for the environment. Plastics have intensified e throw-away habits, particularly of packaging materials f all types and shapes including large gallon milk contain-rs in USA. The Environment Protection Agency, EPA of JSA is increasingly strict on such litter and while return of ontainers for soft drinks — whether of glass or PET — has ome into vogue, this is only a very miniscule part of the lastics waste. EPA's goal is 25% solid waste reduction by 992 but this is a far cry and one estimate is that even 8% s difficult to reach. There is a Centre for Plastics Recycling esearch in Rutgers University of New Jersey besides other rganisations and several new companies offering special-ed services in process, separation, usage of recovered mater-als etc.

Sorting out different plastics is a difficult operation and epend mainly on physical methods such as gravity differ-nces. Additives and compounding materials can upset this. European efforts have advanced in separation and recycling nd the US, a late starter, is taking advantage of the tech-iques available from Europe. The Centre referred to above s a cooperative effort of bottling and packaging companies nd members of the Society of the Plastics Industries and rovides information and news of innovation for a nominal ee. The problem is equally difficult on what to do with the ecovered materials. Production waste in the plastics fabri-ation sector is recycled back by the fabricator and gener-lly does not go out as waste. The recycling arises from aterials fabricated and used and here the question of diverse olymers and different properties arise. Where individual pol-mers are recovered such as with PET there is less difficulty n processing for similar applications. Mixed streams of pol-mers can also be processed for several non-critical appli-ations.

Most US recyclers are using liquid flotation processes to eparate polymers and fillers such as kaolin. Improved hydro-yclones are used to separate kaolin in a stream of water. AKW of West Germany is a pioneer and has three plants of 5,000 to 30,000 tonnes in Europe and is moving into USA. There is a lot of uncertainity on quantities available for recyc-ling which creates problems on economic size of the ope-ration. 1.3 tonnes of household waste is generated per person per year and 7% of the weight is plastics. But, much of this tends to get lost when you handle municipal wastes. Shred-ding, washing, granulation follows electromagnetic separa-tion to remove metals. The plastic is then molded or extruded into fibre or fibrefill and generally used for fence posts, strap-ping, bumper stickers, lumber , drain boards, geotextiles, etc.

Monomer recovery is attractive where feasible. PET can be used to regenerate polyols which can be used for unsat-urated polyester or urethane systems. Microcrystalline pol-ymer (MCP) is also one way for PET, nylon, PP etc. Treatment with hydrocholoric acid and suspending in water as an emulsion enables the MCP to be used as coating for paper. This technology of Battista is to be exploited by a new Canadian firm, and expects good market with paper & pulp processors. Selective solubilisation of styrenic and acrylic polymers helps in separation and recycling of these. The methods of recycling are under study and development with appropriate machines will give a big boost to the recoveries. While most thermoplastic wastes can be reprocessed the thermosets cannot and are only ground to powder for use as filler.

A welcome feature of the plastics recycling efforts is the initiative of some of the major producers of the polymers.

1) Dow Chemical and BF Goodrich are to tie up with WTe Corpn., Bedford MA to collect, separate and recycle PS, PVC, PE and PET in Akron.

2) Dow and Canada's Domtar will take up PET/HDPE recycling in a joint venture using Dow's 'float/sink' tech-nology.

3) Seven polystyrene producers have formed the National Polystyrene Recycling Company to supply new technology to most common wastes and license operations.

4) Du Pont and Waste Management Inc. of Oak Brook in a joint venture to collect, separate and sort out reclaim and market 40 million lbs. a year.

5) Mobil Chemical will start-up a 3 million lb polysty-rene recycling plant at Genpark, Leominster.

(Source Chem. Business, Sept 89).

As mentioned earlier Europe is ahead in programmes for recycling of plastics. The latest is a £300,000 programme in UK launched by the British Plastics Federations in two

key cities — Manchester and Sheffield. A two year research had been taken up prior to this. The funds are from "voluntary" levies on producers and from consumer groups such as "Friends of the Earth". Anually 1,50,000 tonnes are recycled in UK of in plant waste and post consumer wastes for articles like telephones, bottle crates, film cassette, battery boxes, clothes hangers etc. Collection of waste costs vary but are high and various steps are being taken to attract the wastes. It is only India which has a well-organised system of collection from home, garbage and clearup before sale to a reprocessor. Of course, prices of virgin materials are so much higher in India and so there is a dominant economic motive for recycling in some common simple mouldings. It may not be an exaggeration to say that recycling will establish itself as a complementary part of the plastics industry and account for 5 to 10% of consumption. Though producers will bear the brunt, the increasing cost of feedstocks and production costs will limit their production levels in the to come.

Another study on "Global Plastics Disposability — nate Solutions" by Chem Systems describes this as the of the future. Plastics are 7% by weight of urban solid but 30% of the volume. Present disposal methods ar to be:

	For Landfill Other	Recycling Recovery	Incinera
U.S.A.	85	10	5
W. Europe	55	15	30
Japan	25	5	70

More useful methods such as for energy and res recovery is practised outside of USA. But, USA is exp to catch up in materials like polystyrene, PET & PV

Another 'down' cycle in polyolefine prices?

After a bumper two years of tight supplies, capacity level operations and very remunerative prices for polyethylenes there has been a sharp fall in prices and in demand growth. Capacity has perhaps expanded faster than demand growth and the inventory build up has also cut into offtake. There is a lot of additional capacity build up along with plans for more ethylene when the damper has come raising doubts about the future. There are fears of a slowdown or mild recession in the US and Europe which could lead to a repetition of the cycle of lower prices. In HDPE the explosion of Phillips large plant has given some relief but the options for the future is clouded with some uncertainty as to whether US economy will grow at 3%, Japan at 4% per year and Europe at 3 to 4% in the Nineties. Matter of greater concern is the build up in Asia and in the Middle East.

Polyethylene market in WE was 7.65 million tonnes in 1988 as against 8.25 million tonnes in US and there are big differences in the grades used:

	U.S.	W. Europe
HDPE	46%	34%
LDPE	35%	57%
LLDPE	19%	9%

This can also add to the imbalance with some grades in short supply. HDPE production declined 1.6% in the first half of 1989 in U.S. as against a 5% of growth in 1988. The US production of LDPE declined in 1988 by 2% and further by 6.2% in the first half of 1989. It is estimated that 3 million tonnes of additional capacity will be added before 1972 --of which 1.6 million will be HDPE with alternative of LLDPE in the same plant. Operating rates are said to decline in 1990 and sales effort may lead to price reduction -- a decline of 15% for all types since beginning of 1989 -- 7 to 9 cents per pound.

There is even greater concern on polypropylene. US a boost with exports but these have started to decline. Ex prices were more attractive than domestic prices but not longer. Capacity expansion is set to far exceed the dem growth in 1990 and capacity utilisation has already decl to 83% in USA. The cycle of demand build up, capa expansion, subsequent over capacity is likely to be repea There is a vast improvement in technology and in the v ety of polymer grades but prices for the future are clou Inter polymer competition also comes to play when pr fluctuate by wide margin. Phillips have restarted the p propylene plant which was not damaged in the blast. T US consumption of PP in 1988 was 7.1 billion lbs with ex sions 40%, injection moulding 27%, blow moulding exports 17% and resale/compounding 14%. Growth in c sumption has been lower than the 4 to 5% forecast and cap ity in 1989 was 8.5 billion lbs. with 88% utilisation. export market is what is uncertain with the big build up side. Fibres and filament end-uses have boosted the ex sion grades and this may continue to grow at high rates. P reduction may lead to wider use of injection molding for ite like furniture, housewares, office equipment, luggage brief cases, tys etc. But the prospects are not as bright a looked a year back. European producers are most worr about the build up in the Gulf which not only cuts into th export market but also a part of their domestic market. single Europe of 1992 is negotiating on politices and ta on imports. SABIC of Saudi Arabia is the main compet -- 25th in the world rank of petrochemical companies.

India is set to complete the gas cracker in 1990 and p haps one or two of the other planned projects in 1991 & 19 but the international supplier and price situation is likely be far easier by then. But our taxation and high cost struct and import regulations may not upset our production pla

Plea to ban alcohol exports

The chemical industry has projected a deficit of 67 lakh litres of industrial alcohol during the current season. This assessment excludes the requirement of West Bengal, which depends on Uttar Pradesh and Bihar.

The leading association representing the chemical industry has written to the Joint Secretary, Department of Chemicals and Petrochemicals, requesting him to ban export of alcohol in the changed circumstances.

The alcohol availability during 1988-89 was satisfactory due to huge stocks carried forward at the beginning of 1988-89 season in Uttar Pradesh and Maharashtra. This resulted in storage problems in distilleries, necessitating immediate removal of piled-up stocks. The government, therefore, permitted export of alcohol out of India. The exports took place almost at the fag end of 1988-89 season resulting in negligible carry-over stocks for the current 1989-90 season.

The opening balance with distilleries in UP and Maharashtra are very low. In addition to this, demand of alcohol has increased due to expansion of existing units and commissioning of new units. This would further aggravate availability of alcohol during the current year.

The following are the production in six States (Maharashtra, Andhra, Gujarat, Karnataka, Tamil Nadu and UP) which control about 83 per cent of the total production in the country. Opening balance is 325 lakh litres, estimated production, 7,696 lakh litres and the total availability, 8,021 lakh litres. The demand, on the other hand, is put at 8,088 lakh litres (industrial use 4,565 lakh litres, potable 3,020 lakh litres and other uses 503 lakh litres). This leaves a shortfall of 67 lakh litres and continued export will worsen the tight situation, the association feels.

Among all alcohol-based chemicals, production of acetic acid has increased significantly, almost by 60,000 tonnes, involving an investment of approximately Rs. 70 crores. The major impetus was the demand from PTA plant of Reliance Industries, the single largest consumer. Production has gone up to almost 1.4 lakh tonnes as against the demand of 90,000 tonnes.

Last year also saw massive investments in other alcohol-based products MEG by India Glycols and polyethylene by Abhey Oswal. Other projects are also being proposed for products like butanol, octanol and VAM. In Maharashtra, SM Dyechem is proposing to set up an EO/MEG plant based on alcohol, whose viability has been questioned both on the ground of feedstock availability and price. Rama Petrochemicals is planning project in UP for which the State Government has committed alcohol supplies.

TRANSPEK SHARES FOR WORKERS

Transpek Industries Limited, a heavy chemicals manufacturing unit at Baroda, has set a precedence for the Indian corporate world by allotting shares to its workers more than what is stipulated in the finance ministry guidelines.

Under the guidelines, the companies could reserve five per cent of shares to their employees or workers whenever they come out with an equity issue. But in making available 200 shares each to its 950 employees, Transpek has reserved nearly 23 per cent of the Rs. 72 lakh share issue it recently came out on a rights basis.

This trend-setting allocation of shares to employees at par has been made at a time when the value of Transpek's shares are being quoted at Rs. 185. The company's legal exerts hold that there is nothing to bar a company from issuing shares at par. The consent of the finance ministry and the Controll Capital Issues for issue allotme valid only in case the shares are b offered at a premium. The ministry tially was opposed to the moves o company to overstep the guidelines ultimately gave the green signal.

Stating this, Mr. Atul Shroff, c man of the company, said Transpek been setting trends in the Indian co ate world and the latest was a un one. Asked what he meant by uni ness of the scheme Mr. Shroff said 950 workers, each holding 200 sha now hold about 11 per cent equity s in the company and he could not re a similar situation in any other indus unit in the private sector.

Mr. Shroff, replying to quest from newsmen, said the company not given "any thought at the mome to take on the board of managem workers' representatives by virtue their share-holding. This did not m that such a possibility was ruled out the future, he said. He said the comp employed about 1200 workers. But o 950 workers were given shares beca it was the strength of the employ when the decision to allot shares workers and the shareholders appro were taken by the board in June la

Transpek, he said, was in the thre old of becoming a Rs. 50-crore co pany and has on hand several dive fication and expansion plans. Ask whether the 11 per cent stake in hands of the workers did not expo Transpek to a takeover threat, M Shroff said, "We do not have any su fear". He said gone were the days wh the best that was expected of busin was that it should provide jobs, give f wages, make contributions to the pub exchequer and place quality goods reasonable prices in the market. Ind strial relations now have a differe (democratic) face and Transpek's de sion to give equity shares to its worke was a step in that direction, added.

SPIC seeks diversification

Southern Petrochemicals Industries Corporation Ltd (SPIC), which started off as a fertiliser manufacturing company, is gradually shifting its area of interest to other high technology fields in a bid to take care of the uncertainties in the fertiliser business.

As per the corporate strategy, SPIC is aiming at a turnover of Rs. 1,000 crores by 1992 in which the fertiliser business will contribute a 50 per cent share while the other half will come from petrochemical, drugs, electronics, shipping and detergents. The group turnover in 1989-90 is expected to be in the region of Rs. 800 crores of which the share of fertiliser business will be about Rs. 600 crores and the balance is to come from other areas of interest.

Mr. R. Sundarajan, director (finance) of SPIC, said several new projects were being planned to have an even spread of investments in high technology areas. Over the next five years the group would invest around Rs. 300 crores in new projects.

SPIC has tied up with Cipan of Portugal for setting up a drug plant to manufacture pencillin and rifampicin. The project, to be located at Tamil Nadu, will have an investment of Rs. 120 crores and is expected to come up in 1991-92.

Plans are in the final stages to promote a new company, SPIC Fine Chemicals, in technical collaboration with Henkel of West Germany fo. setting up he country's first phosphate-free detergents. The project cost will be nearly Rs. 50 crores. The proposal is awaiting DBI clearance. Mr. Sundararajan said hat SPIC Fine Chemicals would enter he capital marklet later during the year.

Raw material for the detergent proect will come from Tamil Nadu Petropoducts, a joint venture promoted by SPIC and Tamil Nadu Industrial Development Cororation, which manufactures linear alkyl benzene (LAB). Tamil Nadu Petroproducts crossed the Rs. 100-crore turnover mark in its first full year of operation.

SPIC in talks to take over WIMCO unit

Negotiations are in an advanced stage for acquisition by SPIC of the salt unit of WIMCO at Vedaranyam in Tamil Nadu.

This was disclosed by Mr. A.C. Muthiah, Vice-Chairman, SPIC, in response to a question at a press conference convened in connection with the forthcoming public issue of Manali Petrochemicals Ltd. recently.

For SPIC, the unit will be a captive source for consumption by its caustic soda plant which it acquired from the Kotharis some time ago. Earlier, the Kotharis were lifting the salt from the WIMCO unit.

On the proposed Rs. 1200-crore aromatic project being jointly promoted by SPIC and Madras Refineries Ltd., Mr. Muthiah informed that the project has already obtained preliminary approvals and is now awaiting clearance from the Public Investment Board (PIB).

He does not visualise any hitch cropping up at this stage or later as the project is considered essential for the growth of the petrochemicals industry in Tamil Nadu and is also viable.

Explaining the features of the MPL project, he said it will be a 100 per cent import substitution venture as the entire domestic demand for the products (propylene oxide, propylene glycol and polyols) is now met by imports. He pointed out that while the foreign exchange element in Rs. 101.70 crores project cost is worked out at 12 per cent, the plant, once on stream, will help save foreign exchange to the tune of 30 per cent of the cost every year. The plant is expected to start trial production in April this year.

The company is entering the capital market with a issue of 1.60 crores equity shares of Rs. 10 each for cash at par. The subscription will open for the non-resident Indians on January 22 and for the Indian public on January 29.

J.V. BHAT MEMORIAL SEMINAR: "ERADICATION OF WATER-BORNE DISEASE STRATEGY FOR 90'S"

A second seminar to commemorate the memory of late Prof. J.V. Bhat, a doyen of Microbiology in India, will be held in the New Auditorium of UDCT, Matunga, Bombay on 3rd March 1990.

The seminar papers will be presented by eminent scientists and leading members of the medical profession and is a unique event in honour of the late Prof. J.V. Bhat. The seminar will be preceded by presentation of papers for the Prof. J.V. Bhat-Eureka Forbes Award.

The registration fees for participation is Rs. 75 per delegate, Rs. 40 for post graduate students and Rs. 25 for undergraduate students. Crossed cheques may kindly be drawn in favour of "Prof. J.V. BHAT MEMORIAL FUND", and mailed to the following address before 28th February 1990. An exhibition will be organised on the day of the seminar.

For further details please contact: Dr. P.J. Dubash, or Dr. M.Y. Kamat, Co-convenor of Seminar, Food & Fermentation Technology Section, University Department Chemical Technology, Matunga, Bombay 400 019. Tel. No.: 4114302-07.

THANOL

Plea to continue imports on OGL

he Chemical Industries Association, tras has appealed to the Centre to ntain the import of methanol under L for at least another three years ing from 1990-91.

also wants the import duty on the n to be reduced by a minimum of 20 cent from the existing 125 per cent. representation made to the Minis- of Commerce recently, the associa- has pointed out that the present gap he demand and supply of methanol he country will continue for some re time and import is essential to dge it till domestic production picks

It is estimated that the methanol- nsuming industry is growing at a rate 15-20 per cent per annum requiring re of its import in the coming years. wever, the situation is expected to ange in the next three to five years which time the expansion pro- ummes of most of the units as also w licences will be implemented.

As regards price, the association tes that the cost fixed by the domes- producers at Rs. 5300 a tonne is ch higher than the international price Rs. 2000-2300 a tonne. With five per nt excise duty and four per cent Cen- l sales tax, apart from transportation arges, the cost works out to about . 8500 a tonne in the southern region.

The end-users in the southern and stern regions find themselves in a ht spot as there are no methanol man- acturing facilities located there. To ake the matters worse, most of the oducers have joined together to form cartel keeping the price high, the asso- ation has alleged.

According to it, there is no justifica- on for the indigenous price going yond Rs. 4000, taking into account e ruling price of naphtha and other service costs. In support of the case for reducing the import duty, the association has observed that there has been an increase in the international price also in recent years. From $ 99 a tonne in November 1988, the price has gone up to $ 140 as of now and the trend may continue, it says.

UNESCO AWARD FOR 10 INDIAN SCIENTISTS

The Indian scientists are among the 15 recipients of the UNESCO/ROSTSCA awards for young scientists, 1989. The award, instituted in 1985 to encourage young talent in the International year of Youth, is given every year to scientists under the age of 35 for their contribution to basic and applied sciences, a UNESCO release recently said. The award is for scientists from the South Asian region.

The award-winners from India are: Miss. Nirmala Saraswat (ecological sciences), Miss. Geeta Saxena, Dr. Mohammad Athar, Dr. Zohra Singh (basic sciences), Dr. T. C. Kandpal, Mr. V. Purnachandra Rao (applied, geological and marine sciences), Mr. Swapan Bhattacharya, Dr. Parthapritam Das, Dr. Vinay Kumar Singh and Dr. Sunil Dattatrya Sherlakar (informatics).

BHOPAL ACT CHALLENGED

A writ petition was filed in the Supreme Court challenging the validity of the $470-million settlement reached in February last year for payment of compensation to Bhopal gas disaster victims.

The petition sought a direction for placing on board a writ petition filed last year challenging the validity of the Bhopal Gas Disaster (processing of claims) Act, 1985 for hearing and final disposal.

HANDLING HAZARDOUS CHEMICALS

Rules framed to prevent accidents

Rules for the manufacture, storage and import of hazardous chemicals have been framed by the environment ministry with a view to preventing "Bhopal type" accidents and checking "clandestine" dumping of hazardous chemicals into the country. The rules have been framed under the Environment Protection Act and have been notified to come into force, according to official sources.

The rules define a "major accident" as a major emission, fire or explosion involving one or more hazardous chemicals leading to serious effects on man or the environment, causing substantial loss of life and property inside and outside the installation. The ministry had only some time ago framed rules on handling and management of hazardous wastes, which include nuclear wastes.

Describing it as a 'cradle to grave' policy, the sources said that the rules covered all stages of handling of chemicals and wastes from manufacture, storage, import and collection to treatment, transportation and disposal. Ever since the Bhopal gas tragedy in December 1984, a need was felt for having a control scheme on hazardous chemicals. The Environment Protection Act provides the necessary framework for laying down procedures and safeguards for handling hazardous substances and control of chemical accidents of the Bhopal type, the sources said. "This is also reflected in the National Front's manifesto", they said.

The ministry of environment has also been declared as a nodal agency for dealing with chemical emergencies, the sources said. The rules include that 'import' provision in view of the clandestine dumping of hazardous waste now taking place in countries of Africa and Asia, they said.

These rules stipulate that any person responsible for importing hazardous chemicals in India shall provide at the time of import or within 30 days from the date of import to the Pollution Control Board the information pertaining to the name and address of the importer, port of entry, mode of transport, quantity of chemicals being imported and complete product s[illegible]formation.

On receiving this information, the Pollution Control Board or any other concerned authority may direct the importer to take suitable steps if the chemicals being imported are likely to cause a major accident. The importer is required to maintain records of all hazardous chemicals imported by him.

The rules also envisage three levels of controls: low, middle and high. Low level controls require that a person in control of an industrial activity takes the necessary precautions to prevent major accidents, to report those that do and take steps limit their consequ[illegible] Middle level controls apply t[illegible] chemicals and other inflammable highly flammable liquids and fla[illegible]ble liquids for which quantities been prescribed.

POLYMER PRICES UP

Indian Petrochemicals Corpn. (IPCL) has revised the price of two lymers with immediate effect. Low sity polyethylene (LDPE) price gone up from Rs. 29.50 to Rs. 31 & polypropylene quotation has gon by Rs. 2 to Rs. 33 a kg. The price o lyvinyl chloride, of which there are eral manufacturers, remains unchan IPCL is charging Rs. 25 a kg — lowest price among all PVC produ

Meanwhile, all associations repres ting the processing industry made a ted representation to the Union Fina Minister, Prof. Madhu Dandavate, well as officials of the revenue chemicals department on Jan. 13, p testing against the Government notifi tion raising import duty on all polyme The officials are studying the joint re resentation by the user industry (whi was not consulted before the duty hik and may review the decision if such step was warranted, it is learnt. Follo ing the duty hike, Korean producers polystyrene have immediately jacked their price by about $200 a tonne.

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Govt. move on Carbide historic

The recent announcement by the Union law minister, Mr. Dinesh Goswami, on the Bhopal settlement marks the revival of the rule of law not only for the victims but also for the country's future. In declaring that a "life in India is not so cheap that the worst industrial disaster which affected the lives of lakhs could be compensated by $ 470 million." Mr. V. P. Singh's government has sought to restore the dignity of the poor in the third world.

In this sense this historic announcement creates a human rights endowment for all the people of the third world who remain exposed to the mercy of the multi-nationals. The government deserves the nation's applause for acting boldly on the basis of axiomatic moral principles. The strategy of action outlined in the announcement has four important components. First, it declares that the victims have certain "inalienable rights" to remedies. This recognition is entirely consistent with the parental role of the government writ large in the Bhopal Act which has been further elaborated by the supreme court in its December 22 decision.

The *parens patriae* role repells any suggestion of antagonism between the govt. and the vitcims. The Union by the innate logic of the Bhopal Act, is both on behalf of and at the behest of the victims. This logic was unfortunately obscured by last year's settlement. Now it stands vigorously reinstated.

Second, the announcement recognises the right to interim relief. The one-time interim relief programme is not just bureaucratically announced. Rather, the victim groups are to participate in this decision-making process. Thus both the principles of right to information and of participative administration stand inaugurated . The victim groups have proposed a draft ordinance for interim relief for 106,000 families in 36 mun wards of Bhopal acknowledged b Madhya Pradesh government as directly gas-hit. The annual expen on this relief was in the order of Rs crores.

Judge Deo had ordered interim of Rs. 350 crores which the Ma Pradesh high court had reduce Rs. 250 crores. In the discussions will follow it is clear the one-time r will entail a substantial outlay in region of Rs. 250 to 350 crores at i

Third, the announcement takes minimum number of people expose the methyl iso-cyanide (MIC) as n negotiable. At an average of four m bers per family, the minimum incide of victimage exceeds 4,00,000 peo and the actual personal injury cla already filed exceed 1,00,000. This r ognition of a non-negotiable incide of victimage is a significant bre through in the struggle for justice.

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The significance will become clear when we recall that in the May 4 decision explaining the basis of the February settlement, the court had stated the amount ($ 470 million) stood justified by the assessment of about 3,000 dead and 40,000 seriously injured.

The Madhya Pradesh government in the supreme court went so far as to maintain that the number of people seriously injured and disabled was as low as 23 out of the 300,000 it had medically examined.

A decision, which recognised the rights of people living in 36 municipal wards directly exposed to the MIC leakage, proceeds on the simple fact of the high toxicity levels of one of the world's most lethal chemicals. Both scientific common sense and considerations of justice sustain this minimal estimate of the victimage.

Fourth, the government regards conferral of immunities from criminal proceedings given to UCC and UCIL officials as unsustainable on an "important matter of principle" under which the "constitutional and legal rights of victims to seek judicial remedies as are available to them under the law of the land in respect of compoundable and non-compoundable criminal cases cannot be bartered away."

In its December 22 decision, the court had itself pointed out that the Act does not empower such immunities and the petitions, now awaiting hearing, also make the same point.

In keeping with the parental role of the state the announcement indicates that the government will now support the arguments canvassed in petitions yet to be heard. This raises questions concerning the validity of the settlement and the adequacy of the amount.

No doubt many questions will arise, especially in the minds of those who favoured the settlement and thought, for one reason or the other, that it was just and it put an end to the litigation.

The first question is whether the Union of India, being a party to the settlements, can now "reverse" its position. The second is whether Carbide is bound to remain within the jurisdiction of the court.

The latter question can, clearly, be answered in the affirmative. The Union Carbide stands directed by the May 12, 1986, order of Judge Keenan (confirmed by the court of appeals) to abide by the "final" decision of the Indian court. Under the supreme court rules and procedures, a review petition may be filed by the parties affected by the decision. The decision becomes final only upon the disposal of the review.

A seven-judge bench in the Antulay case has also held that the supreme court of India has inherent powers to complete justice in the *self same* proceedings where violations of fundamental rights appear entailed.

The answer to the first question can be found in the May 4 and December 22 decision, where the court has left the issue of the adequacy of the amount to the presentation of "new materials" suggestive of any inadequacy. The government (under Bhopal Act) remains duty-bound to consider such material.

Both the pre-existing materials before the supreme court in the petitions filed by Dr. Nishit Vohra and Dr. Anil Sadgopal and the recent survey of the health status of Bhopal survivors co-ordinated by Dr. S.C. Sathyamala, Dr. Nitish Vohra and Mr. K. Satish entitled *Against All Odds* document the continuing effects of the MIC exposure.

When the Union, in response to its parental role and the directions of the court, considers this material as *prima facie* suggestive of the inadequacy of the amount settled and announces i sion to place it before the court, "reversing" the settlement by ical decision but merely dischar duty to the court.

The December 22 decision e the Union to engage in a *bona fi* resentation of the claims of the v The announcement achieves pr this. The court has clarified that is "no question of the Central g ment acting as a court in resp claims".

This means that the issues standard of inability and the quant damages have to be decided by the cial process. The court has further that the Act prescribes neither.

Clearly the announcement doe unilaterally settle all these quest They have to be adequately ar before the court by both sides. U Carbide may maintain that the re petition should not be entertained. for the supreme court to reach a decision on the basis of various a ments.

The metaphor of "reversal" of settlement is misleading. All that happened is that the Union has indic to the public and the Union Carbide strategy it now wishes to follow.

People, who ask whether there is "precedent" for this announceme should indeed be asking the quest whether there is any precedent in world where a sovereign notified intention to its adversary well ahead finding its forensic strategies.

Carbide has more than due notice cannot complain of violation of the p cess. Indian law allows it all the opp tunities to argue why the settleme orders should not be reopened. T announcement is an invitation to f play and that is how it should regarded by all concerned.

A rapid wrap-up of what's new in Operations, Processes and Products

Polypropylene (PP)

PP continues to experience growth and a number of plants are in the process of being commissioned all over the world leading to fears of excess capacity. It seems that new anti-oxidants in the form of Vitamin E and Vitamin C are being actively considered for PP films for food purposes.

In order to provide security for raw material, a number of companies are adopting propane dehydrogenation led by Statoil in Europe. (*Chem. Ind.* 1989, 20 Nov. (No. 22), 740).

A report in a very recent issue of *ECN* (1989, 18/25, Dec., p. 14) refers to a study by Chem Systems and has clearly brought out the advantages of propane dehydrogenation.

Surfactants

Petresa (along with UOP) have claimed a radically new alkylation process which dispenses HF and uses a heterogeneous catalyst in a fixed bed reactor which gives much smaller amount of by-products. The catalyst life is 2 years and regeneration is automatically conducted in situ.

Eco-friendly technologies are being pursued and growth in U.S.A. is pegged at 2.3%/year and 1993 demand is estimated to be: Anionic, 5 million lb/year; nonionic, 3.273 million lb/year; cationic, 880 million lb/year and amphoteric, 85 million lb/year. In Europe, alcohol based surfactants are enjoying growth in heavy duty liquids. There is a lot interest in carbohydrate-based alkylpolyglycosides. (*Soap/Cosmetics/Chem. Spec.*, 1989, Sept., p. 24).

Rediscovering Cellulose

Phillips has given a very interesting account of cellulose which is attracting renewed interest. The use of aqueous methanol as a solvent at 190°C followed by sodium hydroxide -30% methanol at 170°C and a small amount of anthraquinone allows cellulose, hemi-cellulose and lignin to be separated. A 'physical method' which is attracting attention is the wood (or steam) explosion process where wood chips are heated to 200-250°C under steam pressure of 35-40 atm for about 60s and then the pressure is suddenly released and the components simply shoot apart. The steam explosion process, depending on the time, can reduce DP from 2000 to 200 and the latter variety is comparable to commercial microcrystalline cellulose (Avicel). This cellulose product is soluble in N-methylmorpholine oxide from which brown, shiny fibres can be extruded.

The conversion of cellulose into glucose has seen innovations via the use of $CaCl_2$/LiCl for swelling (by ICI) and acid hydrolysis at 50°C and 4 atm., followed by recovery of acid/electrolytes via electrodialysis.

Hydrophobic celluloses can be obtained with C_{12}-C_{18} straight chain alkyl side chains in cellulose ethers.

CMC can be used to produce a unique yarn which shows elasticity under wet conditions thus making it useful for nappies. (*Chem. Brit.*, 1989, Oct., p. 1006).

New Developments in Separations

Separation of gases with composite membranes containing zeolites

IFP have claimed that a membrane containing an active layer of 70 microns of polyether polyimide (Ultem) particles allows highly selective separation of H_2 and CH_4. (EP 324,679, July 1989, *Chem. Abstr. 1989*, **111**, 176747).

Separation of 1,3 from 1,4 diisopropyl benzene by azeotropic distillation

Azeotropic distillation of the system can be conducted with ethanolamine, PhCN, 2-nitrotoluene, etc. as an entrainer. (U.S. 4,851,087, July 1989, *Chem. Abstr.* 1989, **111**, 176759).

Biological purification of exhaust air using fixed bacterial monocultures

Kirchner, Schlochter and Rehm have developed a biological purification method in trickle bed reactor for air containing 5-35 ppm of acetone, propionaldehyde, naphthalene, toluene, etc. The biocatalysts used were pollutant-specific bacterial monocultures; a combination of monocultures was used for degradation of a mixture of pollutants. The degree of removal of pollutants beyond 80% has been realised. (*Applied Microbiol. Bitechnol.* 1989, 31, 629).

Separation of 2,4 and 2,6 TDI

UOP have claimed that Y-zeolite cation exchanged with K selectively adsorbs 2,6 isomer. By contrast Y-zeolite cation exchanged with Na, Ca and Li selectively adsorbs 2,4 isomer. (E.P. 324,215, July 1989, *Chem. Abstr.* 1989, **111,** 174835).

Solvent selection for extraction from dilute solution

Cockrem, Flatt and Lightfoot have suggested an improved strategy for the selection of solvents for recovery of chemicals from dilute solutions. Key parameters are low solvent losses and high solute distribution coefficient. High solute-solvent b. pt. difference is important. An example pertaining to recovery of **n**-Butanol is given. (*Sep. Sci. Technol.* 1989, **24, (11)**, 769).

Biotechnology

Biocatalysts

The successful application of biocatalysts requires combined skills of both biotechnology and classical organic synthesis (and fortunately the cultural gap between the two areas is now becoming closer). New technological developments stem from, for example, strain optimization through recombinant DNA and molecular modelling; there have been notable developments in bioreactor design. Now liquid-liquid reactions can be conducted with enzymes as catalysts. The well known example is that of 6-APA and 7-ACA. Biocatalysts are now available for the conversion of 2-methoxy-6-isopropylnaphthalene into the naproxene entomer. (*Performance Chemicals,* 1989, Sept./Oct., p. 20).

There are many unique areas where biocatalysts carry out transformations which are not possible with known organic synthesis procedures. For instance conversion of benzene to (benzene *cis* glycol) dihydrocatechol (also haloderivatives of benzene to the corresponding dihydrocatechol). The use of acylases and hydantoinases in semi-synthetic penicillins is growing. Chloropropionic acid has been resolved. The synthesis of L-phenylalanine is also carried out with biocatalysts. (C. Evans, *Performance Chemicals,* 1989, July/Aug., p. 58).

Fermentation n-butanol from CO

M. Worden (of Michigan Biotechnology Institute, USA) has succeeded in converting CO to **n**-butanol at ambient temperature and pressure, even in the presence of sulphur impurities. As of now, **n**-butanol conc. is very low at 0.5 g/litre. (*CMR*, 1989, 20 Nov., p. 5).

Centrifugal field bioreactor (CFBR)

Mersmann and co-workers (from Munich, FRG) h developed a CFBR which should be useful fo increasing productivity of growth and growth linked duction with microorganisms at high cell densities increasing the productivity of highly viscous pseu plastic polysaccharide fermentation. Higher O_2 tran rates are possible for highly viscous liquds. Further centrifugal field reduces the problems associated v foams. For the first time, exoprotein biosynthesis lipase with *S.Carnosus* has been carried out under rile and controlled conditions. (*Chem. Eng. Techn* 1989, **12,** 364).

Cultured plant cells (CPC) -- the chemical facto within

Dicosmo **et al** have given a nice account of this subj which is important as plants are the most importa source of land-based foods, oils, and fibres, and repr sent an immense repository of biochemicals includi flavours, essences, pigments, fine chemicals, pharm ceuticals and novel biologically active substances. Mo of these products are secy. metabolites with wide stru tural variety, but, often specific taxonomic plant grou yield specific homologues. Examples of *Catharanth rosens, Tagetes Patula, Cinchoria liedgardina, Menth Spicata, Artemisia Annua,* etc. may be cited. (*Chem. Bri* 1989, Oct., 1001).

Reduction of ketones with montmorillonite supporte borohydride

Sarkar **et al.** have reduced a few cyclic and acycli ketones in dichloromethane with reusable montmorillo nite supported borohydride. A high percentage of axia attack (76-100%) by hydrides on substituted cyclohex anones was observed. A phase transfer catalyst lik benzyl triethyl ammonium chloride was also incorpor ated in the solid supported reagent. Ketones like 4-t butyl cyclohexanone; 3,3,5-trimethyl cyclohexanone acetophenone; etc. were used. (*Synthetic Communica tions,* 1989, **19,** 2313).

tert-Aliphatic carboxylic acids from correspondin alcohols using sulphuric acid and CO

Takahashi and Yoneda have shown that concentrated sulphuric acid, supersaturated with CO (via *in situ)* dehy dration of HCOOH), can be used for the reaction unde reference to make 'neo' acids via Koch-Haaf carbox ylation. Solvent used were CH_3COOH, CCl_4, etc Nearly quantitative results were obtained. $RA_1R_2R_3OH$ where R_1R_2R were Me, ET, iPr, iBu, etc. (*ibid,* 1989 **19,** 1945).

Extraction of alcohols from aqueous solutions

It has been claimed that 5-perfluorononyl oxyisophthaic acid forms a complex with alcohol which can be decomposed. (Jap. Pat. 63,275, 536, Nov. 1988, *Chem. Abstr.* 1989, **111,** 176723).

4-Isobutyl styrene (IBS)

IBS can be used as a starting material for two-step conversion to ibuprofen. Isobutyl benzene can be reacted with acetaldehyde and diarylethane obtained can be cracked to give IBS. (E.P. 316,014, May 1989, *Chem. Abstr.*, 1989, **111,** 176725).

Dimethylammonium dimethyl carbamate (DIMCARB)

Schroth **et al.** have brought out some very useful properties of DIMCARB which is soluble in most organic solvents and even more interesting, even as a carbamate, distillables at 60-61°C. The components of DIMCARB, dimethylamine and carbon dioxide, are able to react individually. Thus DIMCARB can act as a convenient carrier for the volatile dimethylamine. Thus benzyl chloride can be reacted with DIMCARB to give benzyl dimethylamine. (*Chemik-Zeitung*, 1989, 113, No. 9, 261-271).

Ultrasound (US) in organic synthesis

Abdulla has given a state-of-the-art account of this subject in somewhat of an uncommon journal — *Aldrichmica Acta* (1988, **21,** No. 2, 1-42). The origin, nature and description of the sonochemical effects are given at the outset. Next the sonochemistry of organometallic reactions and miscellaneous applications of ultrasound to heterogeneous reactions are covered. Thus the enhancement of Ullmann coupling reaction due to US has been covered. Sonication favourably influences the course of the Simmons-Smith cyclopropation reaction using Zn dichloromethane in the presence of alkenes.

Oxidation of alcohols by solid $KMnO_4$ under US conditions, giving yields even approaching 93%, has been reported. By contrast with only mechanical agitation yields were typically below 10%.

Vitamin E and its related compounds as antioxidants

E. Niki has given a very useful account of as to how Vitamin E acts as a potent and safe, lipid-solute antioxidant by scavenging primarily chain-carrying peroxy radical and interrupting chain sequence. Niki has stressed that the antioxidant properties *in vivo* are determined not only by the inherent reactivities of tocopherols and tocotrienols but also by their local concentrations at a specific site where the oxidations are taking place. (*J. Synthetic Orga. Chem., Japan*, 1989, **47,** No. 10, 902-915).

2,3,6-Trimethyl hydroquinone (TMHQ) from 2,3,6-trimethyl phenol (TM)

TMP, dissolved in a mixture of an aromatic hydrocarbon and C_{1-4} aliphatic alcohol, can be oxidised with O_2 using $CuCl_2$ and LiCl combination as a catalyst and a limited amount of water. (Jap. Pat. 63,280,040, Nov. 1988, *Chem. Abstr.*, 1989, **111,** 173762).

One-pot two-steps synthesis of 1,2-diol

Fringuelli **et al.** have shown that epoxidation followed by hydrolysis of alkenes with **m**-chloroperoxybenzoic acid (MCPBA) can be done in water with high yield and complete **anti**-stereospecificity. Olefins like cyclopentene, cyclohexene, styrene, etc. were used. The alkene is first epoxidised by MCPBA in water and then the epoxide is directly opened by acid or basic hydrolysis without being isolated. (*Synthetic Communications*, 1989, **19,** 1939).

Catalytic hydration of propylene: Zeolites as catalyst

Mobil have claimed that ZSM-35 catalyses the hydration of propylene in vapour or liquid phase; at a mole ratio of propylene to water of 1:2 and 166°C and 70 atm. pressure, 55% conversion of propylene was realised and selectivity was 99.5%. (E.P. 323,269, July 1989, *Chem. Abstr.*, 1989, **111,** 176743).

Selective hydrogenation of benzene to cyclohexene

Mitsui Petrochemical Ind. have claimed that Ru on hydrotalchite allows selective hydrogenation of benzene at 150°C and 50 atm., the wt. ratio of water to benzene was kept at 4. At 16% conversion of benzene the selectivity for cyclohexene was 47%. (E.P. 323192, July 1989, *Chem. Abstr.*, 1989, **111,** 176745).

Selective ortho alkylation of arylamines

Burgoyne **et al.** (of Air Products) have given an interesting and industrially useful account of selective ortho alkylation of aniline, toluidine, toluenediamine, phenylenediamines, etc. with olefins like propylene, isobutylene, etc. Thus with H-Y zeolite at 92% conversion of aniline, 2-isopropylamine and 2,6 diisopropylamine were formed at 25% and 39%, selectivity respectively. Similarly 2,4 toluenediamine can be alkylated with isobutylene with 85% selectivity at 84% conversion. (*Chemtech*, 1989, Nov., p. 690).

Selective reduction of α-ß unsaturated carbonyl compounds

Hazarika and Barua have used a combination of A1 and Ni chloride in THF for selective reduction of the olefinic double bond of the α-enone system. A variety of α,ß unsaturated carbonyl compounds were used and in some cases yields were as high as 85%. (*Tetrahedron Lett.*, 1989, **30**, 6567).

Microwave oven (MWO) for reactions: From the kitchen to the laboratory

Walton has given a brief account of this subject. The role of water in materials for MWO is well known; water or aqueous solutions get heated but **not** the cup made of ceramic or plastic. Esterifications, hydrolysis of esters/amides, oxidation of alkyl benzenes, nucleophilic substitutions, etc. are typical reactions which have been conducted in MWO. A 1240-fold rate enhancement in the reaction of 4-cyanophenoxide ion with benzyl chloride in methanol has been reported; this type of reaction is relevant in the conversion of morphine into codeine. Solid supported reagents based reactions have also been promoted in MWO. (*Performance Chemicals*, 1989, July/Aug., p. 46).

HLB for emulsification

Graciaa **et al.** have given a critique on the concept of HLB where a common knowledge is that different materials having the same HLB do not lead to the same degree of emulsification. It seems that the partitioning of the emulsifiers in two phase, resulting in the variation of HLB number can explain this anomaly. (*Langmuir*, 1989, **5**, 1315).

Polycarbonate/polyarylates by a new technology

G-E have achieved a breakthrough in TP polycarbonate (PC) which allows even composites to be made with PC and this may well lead to a substantial increase in sales. Here bisphenol A is converted to bis(chloroformate) ester and then reacted to form cyclic oligomers ranging from dimer to eicosamer (n=20) and these are low viscosity 'melts'. The oligomer formation is promoted through the use of trimethylamine (TEA), as a catalyst. There is another strategy where the bis(chloroformate) in methylene chloride is added slowly to a vigorously stirred mixtue of methylene chloride, water, bisphenol A, sodium hydroxide and TEA. The cyclic oligomers are polymerised with anionic catalyst like lithium trifluoroethoxide in boiling o-dichlorobenzene at 180°C. Cross-linked polycarbonates have also been made. This technique will also allow RIM.

The above strategy can also be applied to polyaryl where bisphenol A is reacted with isophatholyl chlor (*Chem. Eng. News*, 1989, 25 Sept., p. 35).

New catalytic route for alphaolefins (AO)

Union Carbide have developed a novel ligand promo having P and sulphonate moities capable of bidend coordination to transition metals (e.g. Ni). These ca lysts are more than an order of magnitude better th the known catalysts and product can be manipulated o a wide range. (*Chem. Eng. News*, 1989, 25 Sept., p. 4

A novel use of MTBE

Methyl *tert* butyl ether (MTBE) has been found to a good solvent for removing gallstones! Treatment an average of 5 hours allows removal in 1 to 3 da Tests on humans are being carried out. (*Chem. Br* 1989, Oct., p. 975).

Asymmetric oligomerisation of propene and 1-bute

Kaminsky **et al.** have shown that approximately 80 stereoselectivity in the creation of the second chiral cent is observed when chiral zirconecene complex (S)- together with methyl alumoxane is used as a catalyst (complex is [Zir(CH_2-indenyl)$_2$ O_2C-CH(OAC)Ph_2] (*Angew. Chem. Int. Ed. Engl.*, 1989, **28**, 1216).

Enzyme-catalyzed enantioconvergent polymerizatio of beta-hydroxyglutarate in organic solvents.

Gutman and Bravdo have developed this strategy fo symmetrical hydroxydiesters and dihydroxy monoest ers which exploits the prochiral sterospecity of enzyme in organic solvents. Thus chiral polyesters from achira monomers possessing alpha-symmetry can be made. (*J Org. Chem.*, 1989, **54**, 5645).

SO_2 removal from flue gas

Dow have claimed that high boiling point hydroxyalky -2-piperazinones (more than 0.1M) can be used to absor SO_2 between 5 to 95°C; thermal regenration is satisfac tory. The feed gas can have SO_2 from 10 ppm to 4 vol. %. (*Process Eng.*, 1989, **Sept.**, p. 23).

Removal of phosphates down to 0.15 mg P/l

Wastewater containing phosphates can be precipitate with lime or iron/aluminium salt, in the presence of magnetic carrier like magnetite and then High Gradien Magnetic Separator (HGMS) can be used. (*Process Engg.*, 1989 August, p. 19).

TY HIKE ON POLYMERS

Processors, producers at loggerheads

lastics are to cost more. Producers make polymers as well as processes who convert them into colourful cles like trays, buckets, bags, pens, pers, and toys alike agree that prices go up. Both also agree that polymer es are, perhaps, the highest in India. agreement ends there. Producers the duty hike was long overdue. cessors say the producers are used uch hefty margins that a short-lived sh in global prices made them scurry Delhi with an SOS to save them from om.

And the officials have obliged. One only to flip through the annual orts of major polymer producers to how profitable their operations are. cessors have all along complained t local producers have been pricing ir polymers not on the basis of their n cost, but the landed cost of imports. cessors have no choice because local oducers make only half the country's quirement of polymers.

What will be the consequences of the est import duty hike? One, indigenus producers will raise their prices fore long. Growth in mass-consumed oducts like PVC pipes and new applitions may be stunted. Agricultural plications like mulching and canal ing will not receive encouragement. chibitions like Plastindia will take a ck seat.

The PVC Resin Manufacturers Assoation has welcomed the duty hike and ntested the processors' version. cording to Mr. S.C. Jain, President of e association, "the c.i.f. price of PVC ll from $900 in March 1989 to $600 i.f. in January, 1990. Even taking into count the depreciation of the rupee om Rs. 15 to Rs. 17 a dollar, the nded cost of imported PVC has come own by Rs. 3,300 per tonne in this eriod. "The decision of the Governent to increase the duty from preferd sources by an effective Rs. 3,500 a nne has not come a day too soon. ven after this duty increase, the landed cost of imported PVC will be approximately Rs. 23,000 as against the lowest Indian price of Rs. 25,000 a tonne".

How much will local producers gain if they were to raise their prices to a level of Rs. 2 less than the landed price of imported polymers? About Rs. 425 crs. According to an industry expert, the public sector, IPCL will be the single largest gainer, collecting Rs. 125 crs. The temptation to raise prices in a protected market is hard to resist. This is not to suggest that producers are rapacious and processors are angels. Many processors on the quota list of local producers calling themselves small units are too small to be detected by the naked eye.

R & D IN INDUSTRIAL SECTOR: ASSOCHAM DRAWS UP EIGHT-POINT PLAN

The Associated Chamber of Commerce and Industry of India (ASSOCHAM) has drawn up an eight point programme to speed up research and development in the industrial sector in the context of trebling expenditure on science and technology to three per cent of GNP as envisaged in the Eighth Plan.

The chamber has suggested a new approach to R & D both in terms of content and methodology so as to derive optimum advantage at minimum cost. According to the ASSOCHAM study on "investment on science and technology during the Eighth Plan period", the thrust in the future should be on innovative and export oriented R & D with socio-economic relevance rather than theoretical, supportive or mere problem solving research.

The research and development, according to the study, should not only aim at improving productivity and quality of products and cutting down of costs, but also on immediate commercial exploitation.

Industry shocked by import duty rise on plastic raw materials

The government decision to effect a steep increase in import duty on polymers has shocked the plastics industry, particularly when the prices of polymers in the international markets have already gone up substantially.

A large number of plastic units in the small scale sector are already finding the going tough because of a substantial increase in raw material cost, and the industry circles fear that this additional burden in the customs duty may force many units to down their shutters.

The polymer prices in the international market have gone up by 20 per cent to 35 per cent during the last 10 to 12 weeks and the new notifications are likely to immediately increase further the raw materials costs by Rs. 2,700 to Rs. 10,500 per tonne, according to Mr. Vijay Merchant, president of the All India Plastics Manufacturers' Association.

The price of high density polyethylene (HDPE) during past few weeks in the world markets has gone up by 30 per cent to 35 per cent, that of LLDPE by 25 to 30 per cent, polypropylene by 20 per cent and polystyrene by 25 per cent. With the new hike in the import duty, the cost of polystyrene will go up by Rs. 10,500 per tonne, that of LLDPE by Rs. 5,000, polypropylene by Rs. 8,500, HDPE by Rs. 2,700 and PVC by Rs. 3,500 per tonne.

"Surprisingly, the hike in duty has come at a time when the plastics industry was expecting relief from the high cost of raw material", said Mr. Merchant. Already the polymer prices in India are the highest in the world and countries like China, Thailand, Indonesia and Sri Lanka had halved the duties on imports of raw materials realising the real potential of polymers, he added.

The increase in import duties will induce local producers to hike their selling prices further and the ultimate sufferers would be the small-scale industry sector and the agricultural sector, whom the new government wishes to support, Mr. Merchant stated.

Important applications such as water management, canal lining, drip and sprinkler irrigation, packaging farm products and the common man's low-cost necessities will greatly suffer with this additional burden of polymer costs, he added.

KRIBHCO SEEKS ASSENT FOR UREA PLANT

Undeterred by the recent rejection of its bid for the fertiliser project at Shahjehanpur, the Krishak Bharti Cooperative Ltd. (KRIBHCO) has expressed its readiness to set up an ammonia-urea complex anywhere in the country. The complex is among the various projects planned by the premier national level cooperative society whose gas based fertiliser plant at Hazira has proved its track record. The plant has produced more than six million tonnes of urea in the last four years.

KRIBHCO's operations director, Mr. H.S. Kohli, told newsmen that the society believed that the Government would recognise its past performance while allotting future projects. The giant cooperative was formed in April 1980 and has more than 1800 cooperative societies as its members with a total share capital of Rs. 446.14 crore.

Though the main objective of KRIBHCO is manufacturing and marketing of fertilisers and other agro-inputs, as part of its diversification programme it has also proposed to set up a petrochemical complex near Hazira. Mr. Kohli said that the society wanted to go in for the petrochemical field in view of the availability of the gas at Hazira.

As the organisation has g substantial internal resources plans to augment and moder ammonia capacity at KRIBHCO has also made a pro the Government for setting up venture with Jordan Phosphate M produce the much needed pho acid with an investment of crore, Mr. Kohli said.

Mr. Kohli said the performa KRIBHCO had led the Departm Atomic Energy to entrust it w responsibility of executing ammonia extension project.

The erection work of the pro almost over and the project is lik be completed much before Nover this year, its scheduled date of co tion.

KRIBHCO's record on the fr environmental protection and poll control was lauded recently wit plant getting an award set up fo purpose by the Fertiliser Associati India for 1988-89.

'BASEMENT OIL' OUTPUT TO STEPPED UP

The State-run Oil and Natural Commission (ONGC) plans to set oil production through an emphas 'basement oil' production. ONGC ces said at Calcutta that a plan already been made for productio such oil from the fractured base rocks of western offshore. "It will e tially be new oil from our old fie they said.

For starters, ONGC envisione extract about one million tons of ment oil every year from 199 onwards. Operational and fina details on this count were still b worked out. As things now stand thrust of the new ONGC plan woul on Bombay High.

NUFACTURING VAM

SI Viscose proposal rejected

The government has rejected the proal of South India Viscose Limited the manufacture of 10,000 tpa of yl acetate monomer (VAM). The ject costing Rs. 36 crores was proed to be set up at Parangipettai in uth Arcot district of Tamil Nadu. The mpany had proposed to finance the ject cost of Rs. 36 crores by way of ue of equity capital, loans from banks her than financial institutions) and ernal resources.

The government's rejection came on e ground that the raw material quired for the project has not been sured to the company. Meanwhile, in sponse to the company's public otice, objections were raised by Polyem Limited and Vam Organic Chemals Ltd. on the ground that the demand cenario in the country did not justify ny fresh creation of capacity in the roposed item and that already there as a licenced capacity of 55,000 mta gainst a projected demand of 44,000 nta by the end of the century.

It was further pointed out by the bjector-companies that they had well bsorbed the technology for the manfacture of VAM and as such there was o justification for expenditure on forign exchange for repetitive import of now-how for this project. Both the bjector-companies stated that the proosed project of South India Viscose td. had been underestimated since a ninimum of Rs. 50 crores was needed o establish a grass-root plant at the moment, where as the company hasd shown only Rs. 36 crores as the project cost.

In the meantime, South India Viscose Ltd. has proposed to make a massive investment to the extent of Rs. 527 crores for setting up two new projects at Manali near Madras. Of the two projects, one is with an investment of Rs. 360 crores for the manufacture of acrylonitrile and acrylic fibre, having a licensed capacity of 70,000 tons and 20,000 tons each with an estimated annual turnover of Rs. 154 crores and Rs. 140 crores, respectively.

The company proposes to finance the project cost of Rs. 360 crores by way of term loans from financial institutions (Rs. 200 crores), debentures (Rs. 110 crores) and internal resources (Rs. 50 crores).

The second project involving an investment of Rs. 167 crores is for the manufacture of styrene and polystyrene having a licensed capacity of 80,000 tons and 40,000 tons each with an annual estimated turnover of Rs. 148.80 crores and Rs. 128.30 crores, respectively.

The cost of the second project Rs. 167 crores, is proposed to be financed through loans from financial institutions and debentures (Rs. 125.25 crores) and internal resources (Rs. 41.75 crores).

South India Viscose responds to ONGC's call for indigenous lignosulphonates, saving the nation valuable foreign exchange

South India Viscose Ltd., Coimbatore, in technical and financial collaboration with Dressers Magcobar (M-I Drilling Fluids) U.S.A. will manufacture lignosulphonates. Dresser has lignosulphonates manufacturing plants in Brazil & U.S.A.

The new company SIV-Magcobar Lignins Ltd., Coimbatore is the subsidiary of South India Viscose Ltd. The company will have an investment of Rs. 6 crores. Dressers participation in the equity of the subsidiary is 40% while that of South India Viscose Ltd. is 60%.

The project was conceived in 1982. It took considerable time to establish the minimum economic viability from the domestic, Middle East and near Far East markets. The plant located at Sirumugai has an installed capacity of 12,000 tonnes lignosulphonates per annum. Beginning with the capacity of 6000 tons, output will double at the commencement of the second year and touch the 12,000 ton mark. 50% of the total production will meet the requirements of ONGC, Oil India Ltd. and foreign oil companies operating in India. Remaining production will be exported to South East Asia.

As a result of close interaction of the two companies the plant has less than 1/2 % of imported capital goods. The plant also incorporates the latest technology.

The supply of lignosulphonates to ONGC will be made from 100% indigenous raw materials. This raw material (calcium bisulphite solution, commonly referred to as wood liquor) is a by-product of South India Viscose's pulp plant.

SIV-Magcobar Lignins Ltd., will manufacture four grades of oil field lignosulphonates and 20 types of industrial grade lignosulphonates which find application in concrete mixes, refractories, briquetting, dyestuff, cement, foundry, cattle feed and dry-cell batteries.

The country is currently importing its entire requirement of lignosulphonates from U.S.A., Canada and the Scandinavian countries. SIV-Magcobar Lignins Ltd., will therefore not only lead to import substitution, but will earn the country valuable foreign exchange.

The construction of the plant was commenced in mid September 1989 and it is gearing up for its first physical export in February 1990. As a result of tremendous interest from domestic and international customers the company is already planning its phase 2 and phase 3 expansion programme.

New exim policy to ease procedures

The new export and import policy (exim) to be announced in April will focus on procedural simplifications to further boost exports. This assurance was given by the Commerce Minister, Mr. Arun Nehru, while responding to complaints of the Marine Products Export Development Authority (MPEDA) at a review meeting at New Delhi.

The Authority had pointed out that the prospects of sea food exports were being hampered due to procedural delays in the allotment of land for development of prawn farming and chartering of vessels for deep-sea fishing.

The Minister favoured single window clearance for all export sectors, including marine products, and said he would take up the matter with the Finance Ministry and other agencies concerned. Denouncing procedural delays for their "harmful effect" on exports, the Commerce Minister said he found it "absurd" that the exporters were in many cases required to approach scores of agencies for obtaining a single clearance.

In a strategy paper on development perspectives in the Eighth Plan 1990-95 for marine exports sector presented to the Minister, MPEDA has pointed out that the overall growth in India's seafood exports had been slower than that of countries like Thailand and Taiwan. This was largely because of delays in implementing development schemes in the fisheries sector.

Exports of Indian marine products form only 0.31 per cent of the total quantity of world marine exports and only 1.3 per cent of the total value of world marine exports. This was in spite of the fact that the resource potential in the two million sq. km. of India's exclusive economic zone (EEZ) wa 4.5 million tonnes. Of this, only lion tonnes are currently ex mainly from the onshore/regio

OLD POLICY EXPIRES O MARCH 31

The life of the existing thr exim policy has been curtailed year following the Government' sion to adopt a new policy from 1. The existing policy was va three years from April 1, 1988 to 31, 1991. Accordingly, the ex Exim policy and the hand book cedures will cease to be valid April 1, 1990, it was offi announced.

The validity of the open ge licence (OGL) order has also bee tailed up to March 31, 1990. How shipments would be permitted u June 30, 1990, in respect of firm o backed by irrevocable letters of c opened before February 28, 199 case letters of credit opened after ruary, imports would be permiss only if shipments were effected March 31, 1990.

The last date of receipt of applicat by the licensing authorities for gra supplementary licence for import of material and components as well application from new units duly ommended by the sponsoring auth ties has been notified as February 1990.

ESCAP FORESEES 5% GROW RATE FOR INDIA

The Economic and Social Council Asia and Pacific (ESCAP) says proj tions show India will have around f per cent growth rate during the next t years. Quoting the organisation's p jections on Asia's economic trends, ESCAP Executive Secreta Mr. S.A.M.A. Kibria, said India wo have a growth rate of 5.2 per cent 1990 and 4.7 per cent in 1991.

New tariffs for PTA, DMT soon

A change in the tariff protection structure for purified terephthalic acid (PTA) and dimethyl terephthalate (DMT) units is in the offing. This follows the government's decision to review the import duty on paraxylene, which goes into the production of these chemicals. The present import duty on paraxylene is considered to be too high.

The issue was discussed at a recent inter-ministerial meeting following complaints that Bombay Dyeing had to pay nearly double the price of the domestic cost of production for the paraxylene that it buys from another domestic producer. However, it was decided to await the results of the study of the cost of production of paraxylene being made by the cost accounts branch of the Finance Ministry to arrive at a fair selling price for paraxylene.

If the import duty on paraxylene is cut or its price lowered, the protection offered to domestic PTA and DMT units would automatically be reduced. Currently, both DMT and PTA enjoy a tariff protection of 190 per cent. There could also be a cut in the prices of polyester staple fibre and polyeser filament yarn. There is also a proposal to place the import of paraxylene under open general licence (OGL). At present imports of paraxylene are canalised through Indian Petrochemicals Corporation Limited (IPCL).

This has little meaning in terms of exposing the domestic producers to international competition. In fact, the charge has been that these producers, whose cost of production is quite low, have been making hefty profits since imports are not allowed unless domestic availability is exhausted. They have been making their sales at prices which are equivalent to the landed cost of imported paraxylene while their own costs are much lower.

The study by the cost accounts branch has become imperative since the new units have been claiming that their cost of production would be much higher than that of the old units. In its report submitted to the government in December 1988, the Bureau of Industrial Costs and Prices (BICP) had said that at the then prevailing international prices, the domestic paraxylene industry did not require any tariff protection.

The government has recently increased import duty on certain plastics keeping in view the fall in their international prices. Among them are PVC, LDPE, HDPE, polystyrene and polypropylene. For LDPE, HDPE, polypropylene and polystyrene the tariff protection now offered to domestic industry is about 100 per cent. For PVC the protection offered is about 50 per cent since some of it is imported under special arrangement with Bulgaria.

Between February 1989 and July 1989 international prices of PVC came down from $950 per tonne to $750, LDPE prices from $1,100 to $800 and HDPE from $1,150 to $1,000 per tonne.

Even the PSF prices have come down by 30 to 35 cents per kg. The basic customs duty on polypropylene and copolymers of propylene has been hiked from 20 per cent ad valorem to Rs. 7,000 per tonne, on HDPE moulding powder and granules from 20 per cent ad valorem to Rs. 6,400, on LDPE and its copolymers (other than LDPE based sheathing compound and insulating compound) from Rs. 2,000 to Rs. 6,200 per tonne, on PVC (other than paste grade and battery grade) from Rs. 1,000 to Rs. 2,000 and on polystyrene (including copolymer of styrene) from 30 per cent ad valorem to Rs. 17,500 per tonne.

The auxiliary duty of customs in respect of PVC (other than paste grade and battery grade) was increased from Rs. 3,000 to Rs. 5,000 per tonne. Similarly, the auxiliary duty of customs in respect of polystyrene (including copolymers) and polypropylene (including copolymers) was hiked from 30 p ad valorem to 45 per cent ad va

However, in the last few da prices have again shown a tende go up. There has been an incre about $50 per tonne in case of L and HDPE. The international m situation is therefore being kept constant watch by the governme

CHEMTECH-'90 IN OCTOBE

Chemtech Foundation, the In Industry Association for Techno Transfer and Upgradation announced 'Chemtech-'90' with major international exhibitions and ferences scheduled to be held at Delhi for seven days from Octobe 1990, according to its press releas

Mr. Jasu Shah, Foundation Presid said that the first one is known Chemtech '90, India's eighth inte tional exhibition and conference for rochemical, refining and proc engineering industries. The second 'offshore and energy India '90, Indi fifth international exhibition and conf ence for offshore, energy and mar technologies and equipments and third is process control and automat '90, for process control equipment, d ital control system, electronic devi for industrial safety, and software process flow.

The international conference w focus on an exchange of informatio innovative ideas and latest research a development findings between natio and international businesses. A gala of eminent experts representing t Government and industry, both fro India and abroad will present 100 tec nical papers on the current status a future prospects of frontier technologi and equipments. Over thousand del gates from about 14 countries a expected to participate in the three sym posia and three technology seminar which comprise the international co ference, he added.

EVELOPMENT OF COAL, LIGNITE IN EIGHTH PLAN

Rs. 20,399 crore investment suggested

The working group on coal and lig-te has proposed an investment to the ne of about Rs. 20,399 crores during e Eighth Plan for the development of al and lignite.

Of the proposed amount, a sum of out Rs. 13,946 crores is earmarked r Coal India Limited (CIL), about s. 2,358 crores for Singareni Coal ompany Limited (SCCL), about s. 3,830 crores for Neyveli Lignite orporation (NLC) and about Rs. 265 rores for research and development chemes.

The amount for the Eighth Plan has been proposed against capital outlay for the Seventh Plan (1985-90) of about Rs. 6,000 crores for CIL, about Rs. 580 crores for SCCL and Rs. 700 crores for NLC and about Rs. 120 crores for R and D schemes.

Outlay of about Rs. 30 crores during the Eighth Plan have been recommended for training, about Rs. 150 crores for telecommunication, computerisation and electronification. A total direct assistance of Rs. 543 crores is anticipated by Coal India Limited for Rajmahal, Ghusick and Piparwar projects.

Besides, external assistance in the form of loan/credit for Rs. 1,225 crores for CIL and about Rs. 260 crores for SCCL is expected to be available to the projects. Foreign exchange requirement for the Eighth Plan period is estimated to be Rs. 1,600 crores.

The working group has proposed massive investment in the coal sector with the objective that the entire coal production, at the end of the Eighth Plan, will pass through mechanised coal-handling systems before despatch to consumers.

At present, a total of 128.96 million tonnes of coal-handling plant capacity and 27.76 million tonnes of washery capacity have been existing in the coal sector as on 1.4.89.

It is suggested that mechanisation of the manual board and pillar workings and greater application of "blasting gallery" method to exploit thick seam pillars would be the thrust areas during the Eighth Plan.

A total of 17.85 million tonnes of coal is proposed to be produced from the long-wall powered support faces. In addition to the existing 11 mechanised long-wall faces, nine more are expected to be deployed by 1989-90 and 36 new long-wall sets introduced during the Eighth Plan period.

The working group has, however, suggested CIL to restrict its manpower strength to 7,06,670 as against its projection of manpower strength of 7,46,398 in the terminal year of the Eighth Plan. This, according to the group has to be achieved by freezing the manpower in underground mines at the existing level.

The group has also projected the demand for coal during the terminal year of the Ninth Plan (1999-2000). The tentative demand projected for 1999-2000 is about 459 million tonnes of raw coal and 7.70 million tonnes of middlings. Total coal requirement for power (utilities) has been indicated by Central Electricity Authority as 310.80 million tonnes.

The steel sector envisages 15 per cent ash in the coal blend in the Ninth Plan, requiring 7.75 million tonnes of import of coking coal and resulting in substantial surplus of indigenous washed prime coking coal. This, therefore, may require reappraisal in so far as the construction of new prime coking coal washeries are concerned.

STANDARD ORGANICS

Standard Organics, the flagship company of the Standard Organics group, has taken up a backward integration project for the manufacture of diethyl oxalate at Tarapore, an industrially backward area in Maharashtra. The project is likely to start commercial production by March/April 1990.

To part finance this project and to meet the funds requirements for future growth plans, the company is issuing 1.83 lakh 14 per cent convertible debentures of Rs. 250 each aggregating to Rs. 459 lakhs to the existing shareholders, on right basis, in the ratio of one debenture for every ten shares held.

The rights issue will open on January 15 and close on February 14. On first conversion after six months of allotment, an amount of Rs. 125 will be converted into five equity shares of Rs. 10 each, at a premium of Rs. 15 per share and the balance of Rs. 125 will be converted into five equity shares of Rs. 10 each at a premium of Rs. 15 per share, at the end of 12 months from the date of allotment.

The company has entered into long term contracts for export of 700 tonnes of sulphamethoxazole at a value of $10 million, to various global markets. The company's total export earnings during the current year is expected to cross $12 million.

The current year's working is extremely good. During the nine months the current year, ended December 1989, the company has achieved a sales turnover of Rs. 23.82 crores and hopes to end up the year with a turnover of Rs. 33 crores.

CRISIS OF GLUT

Plea to stop aluminium imports

The aluminium industry has urged the Government to put a stop to the "unwanted inflow" of imported metal into the country. This will help improve the health of the domestic industry which is at present passing through a crisis caused by a glut in the market, according to Mr. P.S. Gupta, Executive Director (Commercial), Bharat Aluminium Company Ltd. (BALCO).

Talking to newsmen at Madras recently, he estimated that between April and December 1989, nearly 50,000 tonnes of aluminium ingots were imported into the country leading to a glut in the market. In terms of value, this amounted to a foreign exchange outgo of about Rs. 150 crores.

Mr. Gupta explained that the country has not only become self-sufficient in aluminium but has also generated exportable surplus. In 1989-90, while the domestic production is expected to be in the region of 4.30 lakh tonnes, the demand will be around four lakh tonnes, leaving a surplus of 30,000 tonnes that could be exported.

But, unfortunately for the country, the international price as quoted on the London Metals Exchange (LME) has been on the slide, from $2200 per tonne in February last year to $1600 per tonne in December. With the metal being cheaper outside, its import, placed under OGL, has gained momentum, Mr. Gupta said.

In this context, he noted that LME prices are highly speculative and not related to the cost of production. In fact, only five per cent of the world trade in aluminium is done through LME with the remaining 95 per cent transacted through other channels like bilateral arrangements.

Mr. Gupta called upon the Government to take measures to encourage export of aluminium and its products. Also, the excise duty structure for the metal should be rationalised.

Answering a question, Mr. Gupta said the industry has been faring well, particularly after the decontrol of aluminium. Many companies have registered good profitability. He, however, hastened to add that the industry has not taken any "undue advantage" of the changed situation and the prices have been maintained.

He pointed out that there was tremendous potential for the growth aluminium industry in the country. Though India has the fifth largest bauxite reserves, the production constituted only 2.6 per cent of the world production. This is a paradox.

The public sector BALCO, on its part, has programmed to tap the potential to the extent possible. To begin with, the company is considering the possibilities of expansion of its smelter, extrusion and rolling mill facilities.

Mr. Gupta disclosed that BALCO will set up a new extrusion plant at Korba with an annual capacity of 16,000 tonnes and costing around Rs. 4.5 crores. Besides, the company is planning expansion and diversification of existing facilities in collaboration with Hydro Aluminium of Sweden which is currently in the process of preparing the feasibility report. This apart, with a view to protecting the environment and conservation of wood, the company is considering tie-ups with auxiliary units for production of various items, he said. Mrs. Usha Roy, Director (Personnel), BALCO, was also present at the press conference.

FIRST NATIONAL CONGRESS ON METALLIC CORROSION

Second National Convention of Electrochemists and First National Co on Metallic Corrosion will be j organised by Society for Advanc of Electrochemical Science and nology (SAEST), Karaikudi, Na Corrosion Council of India (NCC Central Electrochemical Research tute (CECRI) Karaikudi, during February 1990 to 1st March 199

In order to enthuse and encou young workers the emphasis in meet will be on young scientists students. Young scientists who have tinguished themselves in their cho field will be invited to present t work/latest achievements. A numbe teachers, students, scientists and in strialists will be participating in t meet. There will be a poster sessi exclusively for students. Synchronisi with this national meet, the first natio congress on metallic corrosion will held on the 1st March 1990. A numb of key note papers and case studies w be presented.

Those interested to participate ma immediately contact: Dr. N.S. Rengas wamy, Secretary, Society for Advance ment of Electrochemical Science an Technology, (SAEST), Karaikudi-62 006. Tamil Nadu.

ISRO TO STUDY OZONE DEPLETION

Under a recent protocol signed between the Indian Space Research Organisation and the Soviet State Committee for Atmospheric and Environmental Studies, the ISRO is to take up a major study of the ozone and metereological parameters over India. According to an ISRO press release tri-weekly metereological rockets will be launched from the launch pad at Thumba during January 15 to May 15, 1990 for the purpose. During the March-April period, 20 rocket flights carrying Indian and Soviet ozone measuring payloads will conducted while RH-200 metereological rockets would be launched from Balasore.

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HIGHLIGHTS

- An **RPG Enterprise**
- Promoted by CTI Investments Limited, a subsidiary of **Ceat Tyres of India Limited** which has an uninterrupted dividend record for over 2 decades
- Project to manufacture **Methyl Ethyl Ketone (MEK)** in India—a 100% import substitute
- MEK used in **Fast Growing Industries**—Magnetic Tape, Paints, Polyurethane, Adhesives, Lube Oil Dewaxing, etc.
- Technical Collaboration with **Edeleanu GmbH-West Germany,** the world leaders in the manufacture and technology of MEK
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Managers to the Issue

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Merchant Banking Division
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Bombay 400 020

DSP Financial Consultants Ltd
914 Raheja Chambers
214 Bombay Reclamation
Bombay 400 021

Indbank
Merchant Banking Services Ltd.
31 Rasty Sala
Madras 600 001

BOB Fiscal Services Ltd
Phiroze Jeejee Bhoy Towers
16th Floor Dalal Street
Bombay 400 023

ISSUE OPENS: WEDNESDAY, 31 JANUARY, 1990

IDBI plan to revive MALCO

e Industrial Development Bank of (IDBI), as an operating agency for R, is coming out with a fresh revi- cheme to bail out the sick Madras inium Company Ltd. (MALCO), of the three private sector alumin- companies in the country.

he bank has taken up the fresh exer- as the earlier package cleared by R in January last year had been ted by the Tamil Nadu government, ch subsequently came to power.

Among other things IDBI, in its ort expected in February-March, is ly to recommend charging a tariff of aise per unit and maintaining a reg- supply of 60 per cent to the plant.

Meanwhile, the Supreme Court will rtly take up the case filed by the mil Nadu Electricity Board (TNEB) recover the tariff arrears from LCO. It may be noted that the com- y's plant at Mettur dam in Salem rict has been struggling without ade- te power supply since 1978. It was n referred to BIFR in 1987.

The TNEB has also prepared a reha- tation package consisting of reliefs concessions from the financial insti- ons and banks, additional contribu- ns from the promoters and enhanced wer supply from TNEB.

However, BIFR had to issue a wind- up notice in November, 1988, as it nd the state government was not pre- ed to commit itself on the question meeting the power requirements.

It is belived that the company will not e a smooth sailing. Although the ention price system has been abol- ed with the decontrol of aluminium m February 28 last year, MALCO is able to gain much advantage, because its limited production of the metal.

It is not in a position to increase the price in the wake of stiff competition posed by other companies. Under the circumstances, the higher tariff rate of 97 paise charged from April 1 last year has imposed a heavy financial burden on the company.

At the same time, favourable market conditions for aluminium are coming to the rescue of MALCO. It had exported about 9000 tonnes of alumina to China and it is also supplying 500 to 600 tonnes every month to the domestic market.

It is able to benefit from the current demand for the intermediary product as Indian Aluminium Company, a major producer, has cut its production of alumina after the decontrol order.

After a gap of several years MALCO has made a cash profit of Rs. 12 lakhs during the year ended March 1989. But it has a huge accumulated loss of Rs. 16 crores. In the first six months of the current financial year (upto September 30), it has earned a cash profit of Rs. 20 lakhs.

The state government took the stand that the energy quota could be raised to MALCO, provided it was ready to pay the normal tariff fixed for HT industries. But, in a swift move, the governor's regime had declared that the company would be able to avail itself of additional energy and demand quota at normal HT tariff rates so as to improve its working.

An agreement to this effect, drafted by the TNEB's lawyers, and approved by the advocate general, was also reached. It was then agreed that all the pending appeals in the Supreme Court filed by both MALCO and TNEB will be withdrawn.

On its part, the union government increased the retention price of MALCO to cover the tariff rate of about 80.2 paise per unit demanded by TNEB.

However, coming as a bolt from the blue, the chief minister of Tamil Nadu, Mr. M. Karunanidhi announced in the assembly in March last year that his government would not abide by the agreement and would pursue the appeals in the Supreme Court. He alleged that the company's case was hastened just before the assembly elections for "political reasons". Subsequently, TNEB also filed an application in the Supreme Court to recover its tariff arrears.

LEATHER TRAINING CENTRE AT CLE

A centre for training and product development has been set up at the leather centre of Council for Leather Exports (CLE) to meet the manpower requirements of the industry.

According to Mr. M. M. Hashim, chairman of the council, the centre will provide training. It has been promoted with assistance from industry and Rs. five lakhs grant given by Indian Bank.

Speaking on the occasion of opening of the centre recently at Madras, Mr.Hashim stressed the need to set up such centres in other parts of the country. During the Eighth Plan period alone the industry would require about 25,000 trained manpower.

In his inaugural address, Mr. M. Gopalakrishnan, chairman and managing director of Indian Bank, said the enormous potential for expansion and diversification in the industry could be exploited only by increasing the number of trained technical hands. The infrastructure network also had to be strengthend.

Mr. A. Sahasranaman, executive director of CLE, also felt that the sustained growth of the leather industry would be possible only strengthening the training facility.

Tatas keen to invest in titanium unit

The initiative taken by the Kerala industry Minister, Mrs. K. R. Gouriamma to seek Tata's participation in the States titanium industry has to be viewed in the light of the imperative and urgent need to modernise this unit to retain Kerala's commanding position in this field.

The Industries Minister has set at rest all speculations about how and when the Tata team had come. In an exclusive interview, she said that it was on her invitation that the Tata team headed by Mr. N. S. Sunder Raj, Managing Director of Tata Oil Mills (Tomco) had reached the capital for discussion a few days ago. Now the matter has to be taken with the ruling front for the political clearance required.

But the minister is personally convinced that participation of some industrial house which can bring in modern technology and required funds is essential for saving Kerala's titanium industry from extinction. The technology used in the State-owned Travancore Titanium Products (TTP) is more than four decades old and the efforts made by the management and the Government for upgradation of the technology had failed. British Titanium (now Tioxide) the original collaborator, has not been willing to co-operate. Titanium technology is a closely guarded secret of a handful-of companies in the west.

Mrs. Gouri said her only consideration in exploring the possibilities of a tie-up with Tatas is that titanium industry in Kerala has reached a stage where upgradation of technology, expansion and efficient management have become "an urgent necessity" to retain the monopoly it has been enjoying so far. She is dissatisfied with the present condition of the two State-owned units —Trivancore Titanium Products Ltd. (TTP) and Kerala Metals and Minerals Ltd. (KMML) at Chavara near Quilon. The first one is making some profit but the other one had already sustained a loss of Rs. 80 crores.

The profit being made by TTP is the outcome of steady hike in prices of its product taking advantage of its position as a monopoly producer in the country and the high import duty (85 per cent) imposed on the product by the Government of India. The Indian buyers who are waiting in the queue have been lifting the allotment given to them in trickles after paying whatever price the Kerala State Industrial Trading Corporation (KSIPTC), the agency set up to market this monopoly product, has been charging. The present price of ordinary titanium dioxide powder (151 grade) is more than Rs. 50,000 per tonne.

The Industries Minister who is aware of such drawbacks of this industry which is considered as a "gold mine" of the State Government, has said unless something is done urgently, it would be in the same condition as the white cement factory at Kottayam (Travancore Cements Ltd. under the State Government management).

Mrs. Gouriamma denied having any knowledge of the reported proposal to amalgamate TTP and KMML or hand them over to the Government of India to salvage them. Some sources had said that such proposal made by the Bureau of Public Enterprises and the Kerala State Industrial Development Corporation have been hanging fire for long. She said she did not know whether there was any such proposal during the time of the previous government headed by the Congress(I).

It is understood from Mr. K.P.P. Nambiar, chairman of Keltron and advisor to the Kerala Government, who is the link between the Tatas and the State Government that Tatas have offered the necessary investment and the state of the art technology for the modernisation and expansion of the titanium industry either by setting up a totally new plant or by taking over the existing units. Among the existing units their interes in the KMML which has g scope for expansion.

But they are willing to mode TTP also. The investment pro around Rs. 350 crores. In the take over of the existing un assets can be converted into equ ticipation of the State Governm

According to Mr. Nambiar other States including Maha Orissa and Tamil Nadu are wa the wings to invite investment in ium Industry. In fact Tatas who licence and a technical collab understanding with the Soviet Un under pressure to set up a new Ratnagiri.

Tamilnadu Government is neg ing with another party to set up in that State. This being the case K would be making a mistake if it down the offer from Tatas.

The Tatas also have an advanta coming to Kerala. This is the only where exploration of the ilmenite s the raw material for titanium, is w the rights of the State Governme

ENERGY EFFICIENT TECHNOLOGY FOR ETHYL BENZE

A breakthrough in petrochem process technology, called ALBENE technology, has b achieved through the joint efforts o National Chemical Laboratory, P and the UB group's Hindustan Pol ers.

The new technology is a n method to manufacture ethyl benzen a single step from ethyl alcohol benzene is an important intermediat the manufacture of styrene mono which in turn is used to produce pol tyrene — the feedstock for the plas industry.The technology is already o continuous commercial run, at Hin stan Polymer's plant in Andhra Prade

ASTIC RAW MATERIALS

Producers may hike prices

Major indigenous producers of plas- raw materials are considering a sharp rease in the selling prices of poly- rene, polypropylene, PVC, LDPE d HDPE, it is learnt.

IPCL has already suspended the sales plastic raw materials and is likely to se their prices soon. Other major pro- cers such as Nocil, PIL, ABS Plas- s. Hind Polymers, Polychem, Chem ast, etc are also expected to follow it, according to informed sources.

The hike in prices by indigenous pro- cers would be the result of the steep ke in import duty on plastic raw aterials announced by the government rough two notifications on January 5, 990.

"Indigenous producers of polymers ave repeatedly increased prices in line th the rise in international prices and is increase has been in the range of 5 per cent to 50 per cent over the last wo years," according to Mr. Sumati- handra Mehta, president of Organisa- on of Plastics Processors of India.

The hike in import duty will encour- ge local producers to again revise their rices upward. The revised duties have reated a wide disparity between indi- enous prices of plastic raw materials nd landed cost of imports.

"The disparity is alarmingly high at 5 per cent in the case of LDPE and 28 er cent in HDPE over indigenous rices", he said while addressing a press onference at Bombay, recently.

At the current CIF prices the hike in ustoms duties will have the effect of ncreasing the landed cost of polystrene y Rs. 10,500 per tonne, polypropylene y Rs. 8,215 per tonne, PVC by s. 4,200 per tonne, LDPE by Rs. 5,460 per tonne and HDPE by Rs. 4,000 per tonne, according to him.

Mr. Mehta fears that the total burden on the processing industry would go up by Rs. 450 to Rs. 500 crores as a result of increase in customs duties, and expected increase in prices by local producers along with its impact on excise duties, taxes and other levies.

"Such an unprecedented increase in burden will very badly affect about 20,000 small scale processors while handful of local producers of polymers will have a windfall of profits," he said. Mr. Mehta has urged the authorities to immediately withdraw the recent increase in import duties.

The All India Federation of Plastic Industries (AIFPI) has decried the hike in customs duty on import of polymers, arguing that it would "deal a serious blow" to the conversion industry, which meets 50 per cent of its requirements through imports.

In a press release, AIFPI said a large number of small units, which account for more than 90 per cent of the processing industry, would have to close down resulting in widespread unemployment.

Mr. Virendra Kumar, president, AIFPI, while asking the government to repeal the notification, stated that these duties had been based on international prices ruling in August 1989, which were $ 250 lower than the current prices.

OSWAL POLYETHYLENE UNIT GOES ON STREAM

The polyethylene plant of Abhey Oswal in Chembur Bombay (formerly owned by Union Carbide India Ltd.) commenced production on January 10.

The Chembur plant has an installed capacity to produce about 12,000 tonnes per year of low density polyethylene. The plant was closed down in 1985, following the Bhopal diaster.

The Carbide management refused to reopen the plant in the light of the Supreme Court judgement in the Shriram case, which proposed unlimited liability in case of an accident. The plant was acquired by the Oswal group last year.

The recommissioning of the plant was a herculean task because a lot of vintage equipment had rusted and had to be replaced, and getting replacement for the Carbide process plant was no easy job.

To top it all, utmost consideration had to be given to safety and environment protection as the plant is located on the outskirts of Bombay city. The new management had to spend more than Rs. 10 crores in retrofitting and installation of additional equipment.

The public sector Engineers India Ltd (EIL) has been closely associated with the new owners in recommissioning the naphtha cracker and the polyethylene plant, and will continue their association for some more time.

Oswals are already in the polyethylene market, having recommissioned the mothballed ex-ICI alcohol-based polyethylene plant in Rishra, West Bengal, last year. Despite their small scale of operations.

Oswal petrochemical operations are profitable. This is not only because of the wide gap in indigenous supply and demand, but the quality of material that the ICI and UC processes deliver.

Rs. 3,357 crores IOC turnover

The year 1988-89 was a year of achievements for Indian Oil's Southern region covering Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and the Union Territory of Pondicherry, Mr. Ramgadia, IOC's General Manager, Southern region, said.

Addressing a press get-together at Trivandrum on January 11, Mr. Ramgadia said that not only had the Southern region achieved the highest ever sales turnover of Rs. 3,357 crores in 1988-89 compared to Rs. 3,144 crores in the previous year, but the net profit at Rs. 98 crores has gone up by 27.2 per cent as compared to Rs. 72 crores in 1987-88. The sales tax payments for the region from April to December 1989 were Rs. 318 crores.

During 1988-89, IOC sold 6.46 million metric tonnes of petroleum products in the southern region, achieving a percentage increase of 7.8 over the previous year. During the first half of the current financial year (April-September 1989) IOC sold 3.34 million MTs of petroleum products, recording a percentage growth of 5.7 over the same period last year, he said.

Talking about IOC in general, Mr. Ramgadia said, it was the largest commercial enterprise in India and was 11th among 52 petroleum companies outside the USA. It owns six of the nation's twelve refineries in India with 48 per cent of Indian crude oil refining capacity. IOC had a sales turnover of Rs. 15,343 crores and a profit of Rs. 676 crores (before tax) in 1988-89. It had declared a dividend of 20 per cent last year.

Mr. Ramgadia announced that the IOC would set up a new divisional office in Trivandrum soon to further improve its customer service and to cater to the rapidly increasing demand for petroleum products. With th would have 11 divisional offices ing the one opened at Manga November 1989, he said.

He said that the new divisiona and the State headquarters woul the six southern districts of All Kottayam, Idukki, Pathanam Quilon and Trivandrum. This wo only reduce the work load o Cochin divisional office whi present was co-ordinating the s and distribution of petroleum pr throughout Kerala, but would also itate better co-ordination with the Government in the distributio petroleum products, especially kero In addition an Indane area office o in Cochin in 1987 was exclusively ing after LPG marketing, he said

Mr. Ramgadia said IOC was pr ing to increase its LPG bottling ca ity by 45,000 metric tonnes per an (mtpa) with the setting up of the LPG bottling plants at Cochin, Ca and Vijayawada respectively. W work has already begun on the 10 mtpa LPG bottling plant at Vijayaw the Cochin and Calicut plants of 25 mtpa and 10,000 mtpa capacity w be launched shortly and be ready production within 24 months, he s

Mr. Ramgadia said the existing I bottling plants of IOC at Salem Bangalore were already operating ab their full capacity of 37,500 mtpa e Since IOC was the sole marke agency for Madras Refineries Ltd. (I bottling capacity: 84,000 mtpa), the t bottling capacity was likely to go u 204,000 mtpa with the commissio of the three new plants. Mr. Ramga said that during the year 1988-89, I has marketed 255,000 mts of LPG 263 markets of southern reg accounting for a market share of 54 cent. About 87,500 new Indane custo ers were enrolled. Between April November last year 89,400 more w enrolled bringing the total number Indane customers into 20.77 lakhs

MBAY HIGH GAS LIFT PROJECT

Delay may cost dear

The delay in finalisation of the con-ct for the Bombay High gas lift pro-t is going to cost the country dearly. cording to latest estimates, the delay uld easily result in loss of crude oil oduction of between one to 1.5 mil-on tonnes from the western offshore ea next year, depending on the time ken to install the gas lift system.

A million tonnes of crude oil could asily cost about Rs. 100 crores in for-gn exchange at current prices. If the elay is more, the loss could be still gher. Attempts are now being made o increase the production from certain ther fields to partly meet the short-fall rom Bombay High.

According to the original schedule the project was to be completed by November 1990. The letter of intent for the project was issued to the Italian company Saipem, which was to execute it with the engineering backing of Snamprogetti. Both are subsidiaries of ENI.

Though the leuer of intent was issued in July last year, the company had not attended the "kick off" meeting and proceeded with the work as it is disputing certain points in contract. ONGC has threatened to encash the bid bond of Saipem. Formal talks between the two sides are yet to take place to sort out the matter.

However, it looks as if there is going to be no meeting ground between the two. According to oil industry watchers, the Italian company may find it difficult to execute the project at the contracted price as the market has since gone up. The contract was valued at about Rs. 140 crores when it was awarded.

The Petroleum Ministry has asked the ONGC to examine the possibility of terminating the contract. ONGC has already started exploring from other companies as to how much time it would take for them to install the gas lift system if fresh tenders were invited. Though Saipem was a little more expensive than its nearest rival Essar, the Finance Ministry wanted the contract to go on to Saipem because of the $32 million soft credit offered by it to cover bulk of the foreign exchange component of the project valued at $37 million. The Italian credit has, however, not yet been made available, upsetting both Saipem and the Finance Ministry's calculations.

The scope of the project includes design, engineering, procurement, fabrication, load out, tie-down, transportation, hook-up testing and pre-commissioning of 40 pipeline segments totalling about 180 kms. It also covers extension of pipeline risers and installation of valves on well head and process platforms deck piping for exporting compressed gas to Gujarat.

TATAS WILL NOT BACK OUT FROM KARNAL REFINERY

Mr. D.S. Seth, Chairman, Tata Chemicals Ltd., has categorically reiterated that the house of Tata's commitment to the implementation of the Karnal Refinery project, remains firm and undiluted. Dispelling doubts in some quarters that the Tata interest in Haldia Petrochemicals may result in Tata Chemicals deciding to withdraw from Karnal Refinery project, Mr. Seth emphasised that there was no conflict whatsoever between the two projects. Mr. Seth, however, declined to comment on the possibility that, in view of the resource crunch and precarious balance-of-payment position, a mega project like the Karnal Refinery, involving large capital expenditure and current expenditure in foreign exchange, could well be deferred.

Clearance for Haldia after IDBI okay

The Centre will take a final decision on the multi-crore Haldia Petrochemical project in a month or two in consultation with the Industrial Development Bank of India (IDBI).The clearance will be given after going into the structure of the project, tract record of the promoters and other details in consultation with the IDBI.

There has been an urgency injected into the clearance of the project with the National Front government assuming office at the Centre.West Bengal Chief Minister Mr. Jyoti Basu, who did not waste any time in taking up the issue with Prime Minister V.P. Singh himself, had had meetings with Petroleum Minister M. S. Gurupadaswamy on January 4. "The ball is in the court of the state government as it has to come up with its final proposal," official sources said. The basic concept of the project, which had not taken off even after a decade after its proposal, was that the naphtha cracker and the downstream units should be an integrated complex.

The state proposes to have more than one promoter as the cost of the project has gone up from the original Rs. 1,470 crore in 1979 to more than Rs. 3,000 crore. This is not only on account of cost escalation but also because of the new minimum economic size of the plant fixed at 300,000 tonnes of ethylene per annum from the original 100,000 tons.

The Haldia project which was envisaged with 54,000 tonnes of ethyene per annum in 1979 was modified to 100,000 tonnes in 1985 when R. P. Goenka came forward to participate as a promoter. However, the IDBI had objected to it on the ground that such huge financial assistance should not be given to one company and due to the funding and technical objections the project was delayed. In 1989, Basu met the Union Finance Minister and it was felt that there was need for a fresh lo whole project. Accordingly a c headed by a joint secretary in t try of petrochemicals was set representatives of finance IDBI, GTPD and experts in the September 1989. The committ three meetings had referred th to the IDBI when the state gov came up with four alternativ committee had asked the state up with a firm proposal after ing the IDBI. Now the state ment is evaluating the proposal the promoters and after finalisi promoters, it will come up with proposal soon. Since IDBI is opinion that more than one prom necessary for the clearance of project, the state government is le the choice of choosing its pro —one or more groups, and the will not interfere in this matter.

BIRLA CENTRE INSTITUTE AWARD FOR SCIENTISTS

The B. M. Birla Science Centr instituted a Nobel talent search a for young scientists for their "outst ing contributions" in the field of p ics, chemistry, biology and mathem Dr. B.G. Sidharth, director of the ce said recently.

The award, which carried a cash p of Rs. one lakh, would be given f 1990. It would be monitored by a b comprising Dr. M. R. Srinivas chairman, Atomic Energy Commiss Bombay, Prof. C. N. R. Rao, direc Indian Institute of Sciences, Bangal Prof. Narlikar, Director, Inter-Univer Centre for Astronomy and Astroph ics, Poona. Prof. M.S. Raghunath chairman, National Board for Hig Mathematics, Bombay, Prof. C. S. shadri, dean of school of mathemat Madras, Prof. Qasim, vice-chancel Jamia Millia Islamia, New Delhi, Dr Varadarajan, consultant, Plann Commission, and Dr. P.M. Bharga director, Centre for Cellular and Mo lar Biology, Hyderabad.

All-round improvement in ONGC operations

A spurt in oil and gas production, veral hydrocarbon strikes and upgration of the Krishna-Godavari, Cauvy and Assam Arakan basins marked e Oil and Natural Gas Commission's ONGC) operations in 1989.

According to official sources, oil proction rose to 31.07 million tonnes in 989, registering an increase of almost vo million tonnes over 1988.

Similarly, gas supplies by ONGC owed an increase of 21.5 per cent over e previous year. Gas supplies were xtended to 13 new consumers in industies in areas like chemicals, textiles, ower, fertilizers and even tea plantaons. The total increase in terms of oil nd oil equivalent of gas was about 4.9 illion tonnes as compared to productn during 1988.

During the year, oil and gas strikes ere made at eleven prospects, promient among them being Natumilli, diyakkamangalam, Lingala (southern gion), Khoraghat (Assam) and Kutch ffshore.

Three major hydrocarbon discoveries ere in the southern region, which is oised for an over ten-fold increase in oduction in the Eighth Plan, as comred with the Seventh.

Exploration work was extended to fizoram and North Bengal. The first ell on the centre structure in Mizoram as spudded and drilling taken up for e first time at Karadighi in North engal.

A memorandum of understanding as also signed with British Petroleum r co-operation in exploration work in e Himalayan foothills and Ganga alley.

The average time required to put discoveries on production was gradually brought down. The discovery of Lingala in Krishna-Godavari basin was the fastest, with production commencing immediately after the strike was made.

A total of 41 structures have been put on early production system (EPS) and the contribution from these prospects is estimated to be about 1.5 million tonnes per annum.

ONGC also signed several agreements for exploration and consultancy services with international companies during the year. An agreement was concluded with the National Oil Company of Malaysia (Petronas) for two consultancy projects to be carried out at the Institute of Petroleum Exploration in Dehradun, and the Institute of Reservoir Studies in Ahmedabad.

Another consultancy agreement was signed with the National Oil Company of Thailand for exploration in the Gulf of Thailand. An agreement for conducting exploration in Malaysia was also signed.

MOROCCO TO GET $50m TO FIGHT OIL SLICK

King Fahd of Saudi Arabia has donated $50 million to Morocco to help fight the oil slick off its coasts, the Saudi press agency reported.

It quoted the King as saying he hoped clean-up efforts would succeed, after the Iranian oil tanker Kharg 5 spilled more than 200,000 tonnes of crude since December 19. The crippled Iranian tanker was turned away by Portugal, the third country to refuse entry to the ship.

A Portuguese navy boat escorted the Kharg 5 away from the Portuguese island of Madeira after the tanker entered its territorial waters there, the national news agency LUSA said.

RAISING CRUDE OIL ROYALTY

Industry backs Gujarat's plea

Industry and trade have backed up the Gujarat government's demand that the Central government should raise the rate of royalty on crude oil for Gujarat to Rs. 683.50 per tonne with retrospective effect from April 1, 1987.

Voicing the state's demand at a news conference at Bombay, Mr. Dilip R. Parikh, president of the Gujarat Chamber of Commerce and Industry, said the Prime Minister's announcement of an interim relief of Rs. 100 per tonne in addition to the existing royalty rate of Rs. 190 per tonne "is highly inadequate" especially when the state's economy was experiencing considerable stresses and strains at this juncture. He also demanded that the royalty rates should be reviewed once in every two years as recommended by the Sarkaria Commission. Mr. Parikh also made out a strong case for supply of gas to industries in Gujarat at a special concessional rate. He said that "the benefit of low cost fuel found in Gujarat should be made available to the state, as in the case of Bihar, Maharashtra and Mysore." About pricing of gas, he said that a three-tier uniform pricing formula of natural gas, which came into force from March 31, 1987 (Rs. 1400 per 100 cmc for offshore gas, Rs. 2250 per 100 cmc along HBJ pipeline and Rs. 1000/500 for North-East States) has expired on March 31, 1989." The new formula which is being evolved by a committee of Bureau of Industrial Costs and Prices should be based on parity prices of coal at pithead on calorific value basis at Rs. 850 per 100 cmc.

Mr. Parikh also urged the government not to succumb to pressures by the so-called environmentalist lobbies in respect of the Sardar Sarovar project, which was the lifeline of Gujar disruption in the Narmada dam mentation would be unani resisted by Gujarat's people. T gestion that the heights of the reduced was untenable, beca would defeat the basic purpose o its water to drought-prone distri Kutch. He urged the support of a thinking people to the Narmada He strongly criticised the India ronmentalists, who went U.S. to that government's support to sto struction of the project.

CRL LAUNCHES IN-HOUSE R & D

The public sector Cochin Refi Limited (CRL) has launched a house research and development gramme to further augment the mum utilisation of resources th short-term and long-term measu

The R & D programme has be cognised by the ministry of scienc technology, and forms a part of th ence and technology component o country's five-year plan. CRL has blished itself as one of the best oper units in the country and is makin forts to further improve its perform The R and D effort is a step in tha rection.The R and D activities been so designed as to support and rove upon the functioning of the e ing and future operating units in the nery to optimise production and rove productivity. Efforts are also b made to achieve the maximum en economy. The R & D centre will e uate, modify and adopt latest tech ogies wherever available, to suit local needs. Linkages will also be moted between various sectors for c mercial realisation of the results of R & D efforts. The centre will also dertake elaborate research for qua tive and quantitative improvement o finery products, production of new micals and new feedstocks mainly u refinery streams and experimenta computer simulations of produc plant.

Oil firms split over staying on

The U.S. oil giants, Chevron International Ltd., and Texaco are divided over the question of continuing their operations in India under the third round of bidding for offshore oil exploration acreage. While Chevron has decided to quit by April after completing seismic survey in Mahanadi, its partner, Texaco, has offered to drill more wells in India.

This will mean that the joint venture formed by these two companies for their operations in India will have to be dissolved. The chief executive of Chevron in India, Mr. Bradley R. Jones, when contacted, said: "No comments".

The government has already received Texaco's proposal, the details of which are not known. But informed industry circles say that the U.S. company has offered to drill more wells in the Palar and Krishna-Godavari basins. Chevron's decision to pull out, without exercising its option to drill under the next phase of the contract, has surprised oil industry circles because it is the only international oil company which has been consistently showing interest in India. Texaco is comparatively new to India.

Chevron and Texaco, which formed the joint venture as equal partners, drilled two dry wells, one each in Krishna-Godavari and Palar. Together, they got four offshore concession blocks, two in Krishna-Godavari and one each in Mahanadi and Palar, under the third round of bidding. They have seismic options for the remaining two blocks, that is, they can pull out after the seismic survey without drilling any well. Chevron has made it clear that it will not be drilling in these blocks.

If Texaco's proposal is accepted, it will have to drill a minimum of one well in each block. Texaco's first preference is the Palar basin. It is not clear as yet which of the two blocks in Krishna-Godavari it will opt for. The Oil and Natural Gas Commission (ONGC) has been drilling in both Krishna-Godavari and Palar. It has struck oil and gas in both these basins. The drilling results from these basins must have been encouraging for Texaco.

Meanwhile, Shell, which is drilling in Kerala-Konkan, is expected to reach the target depth by the end of this month. It has got two blocks in Kerala-Konkan. It will drill one more well there. All other companies, which signed contracts under the third round of bidding are preparing to spud their first wells by March.

International oil industry circles are keenly awaiting the government decision on the next round of bidding. There has been no political decision as yet on the subject. However, the Ministry of Petroleum has been holding informal talks with international companies on the subject. The plan is not to go in for a global tender but negotiate individually. A number of companies including Chevron have shown interest in the next round of bidding, say oil industry sources.

ONGC ACQUIRES FOREIGN PATENTS FOR NEW DEVICE

The Oil and Natural Gas Commission has won a British and French patent for its invention of the sub-surface pressure gauge, against stiff international competition. ONGC sources say that it won the patents while competing with multinational giants like Schlumberger, Hewlett Packard, Lynbes and Leuterts, all companies which have over two decades of worldwide experience in manufacturing and marketing such devices.

The sources said the electronic gauge could work upto 2,000 hours, as against the 200 hours by the same type of gauge presently available. The gauge can be manufactured indigenously for Rs. 3,000 as against imported electronic clocks costing about Rs. 2.5 lakhs (a set of 12 mechanical clocks). The savings in foreign exchange, ONGC sources claimed, would be of the order of Rs. 8 crores. ONGC has awarded the marketing rights to George and Nicks Inc. of Canada, which expects to sell about a thousand instruments for $3,000 a piece yearly. The US, West Germany and Canada are also likely to acquire the patent shortly, the sources said.

Earlier, one of ONGC's inventions, the photoinclinometer (a device used for measuring the direction of the well) was patented in nine countries including USA, Germany, Italy, France, Switzerland and the United Kingdom. The system has been licensed to a Canadian firm. The firm is presently engaged in devising a commercial version of ONGC's patent, the sources said.

Field trials in Canada, USA, and Britain are scheduled during early 1990. The sale price of this unit is $50,000 each, over which royalty is payable to ONGC on the same terms, the sources said.

OIL FIRMS IN UGANDA THREATEN TO CLOSE DOWN

Oil companies operating in Uganda have threatened to close down their operations following the Government's refusal to raise the dealers' profit margin on petroleum products, the Energy Ministry sources said recently. The only six oil companies operating in the country and which are all foreign-based —AGIP, Shell, Caltex, Total, Esso and Upet — have said that the operating margin offered to them is too small to sustain their business operations. They pointed out that following a further devaluation of the Ugandan shilling, the former 4.90-shilling margin per litre offered to them by Government-controlled prices had been wiped out. The sources explained that for every litre sold, the oil companies lose 10 Uganda cents.

Company notes

RAMA PETROCHEMICALS LTD.

Rama Petrochemicals Limited has reported improved performance for the six month period ended 31st October 1989. The relevant particulars for the six month period ended 31st October, 1989 and the figures for the corresponding period of the previous year are summarised in the table below.

The company has been able to achieve a better result during the six month period ended 31st October, 1989 compared to that of the corresponding six months of the previous year due to reduction in the consumption of raw material, savings in energy consumption and also partly due to the discontinuance of the price pooling system.

The company is hopeful of ending he current financial year with much improved performance compared to the profit for the thirteen month period ended 30th April 1989.

GUJARAT GLASS TO ISSUE CAPITAL

Gujarat Glass Ltd., a company belonging to the Piramal group, headed by Ajay G. Piramal, recently conducted a "ground breaking ceremony" at Kosamba, near Surat, for setting up of a 130 TPD sodalime glass bottle manufacturing plant. The plant is expected to go on stream by December 1990, thus doubling the capacity of sodalime bottles from the current 65 TPD.

Gujarat Glass is the only company in India manufacturing both sodalime and borosilicate glass, catering primarily to the pharmaceutical industry. The company's expected turnover for the year ending March 1990 is Rs. 20 crores. Subsequent to the expansion of its capacity, in a full year's working, its turnover is expected to touch Rs. 40 crores.

The company has recently entered into a technical know-how agreement with PLM Consulting International B V of the Netherlands for technical assistance for the manufacture of glass bottles and vials. The company would benefit not only in relation to its existing operation but also in relation to expansion of its capacity, where PLM would assist them in setting up a sophisticated glass manufacturing plant. The project cost for this expansion is around Rs. 19 crores. The company would enter the capital market in early February this year to finance a part of its expansion.

Particulars	Half year ended 31.10.89 Rs. in lacs	7 month period ended 31.10.88 Rs. in lacs	Percentage increase	Financial year ended 30.4.89 (13 months) Rs. in lacs
Gross Turnover	2149.16	2034.47	5.64	4270.55
Operating Profit	528.94	500.93	5.59	1014.85
Interest Charges	165.00	186.59	-	356.90
Gross Profit	363.94	314.34	15.78	657.95
Provision for Depreciation	177.75	184.80	-	355.45
Profit Before Tax	186.19	129.54	43.73	302.50
Provision for Taxation	-	-	-	-
Net Profit (After Depreciation and Taxation)	186.19	129.54	43.73	302.50

GUJARAT INJECT

Gujarat Inject has secured orders for exports from Afgha Nigeria and Sri Lanka and expe export 25% of the expanded capac the end of the year. The compan decided not only to expand its pr tion capacity on the existing lines fluids but has progressed towards sification in bulk drugs and for tions. It has signed an agreement foreign collaborator to market its duct in tablet form. The drug pat by them is to be used by patients s ing from kidney failure. This will troduced in India for the first time will save patients from a lot of expe & keep them away from hospitalisa

The company has employed tec cal and marketing expertise for this and is likely to go on stream in the future. The turnover of the compan likely to cross over Rs. 40 crores in next 12 months, when two of the j sector projects which are under imp mentation in Kerala and Rajasthan into production. The company also p poses to set up a plant to manufact disposable intravenous administrat sets and other medical equipments. T orders for the machineries have alrea been placed and production will co mence soon. With this, the compa will be full fledged in supplying latest disposable medical equipme under one banner.

CHEMCROWN TO SET UP EC

Chemcrown (India) Ltd., a Calcu based company engaged in the man facture of leather processing chemica dyes etc. is making a bonus issue in p portion of 1:1 to its shareholders. T present paid-up capital of the compa is Rs. 1 crore and equal amount is to capitalised from the reserves. The co pany proposes to make an issue of lakh equity shares of Rs. 10 each a premium to be decided by the Contro ler of Capital Issues.

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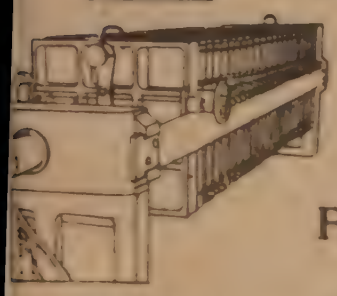

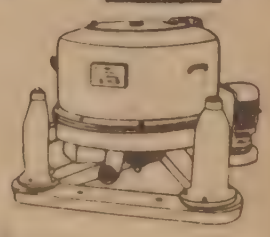

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sor of E. Coli with iminothiolane. The remaining sulfhydryl groups then were alkylated with a phenanthioline derivative that can form copper complexes.

Once bound to DNA, the coordination complex in its cuprous form joins with hydrogen peroxide generated in-situ to oxidatively attack the DNA at a deoxyribose. (*Science*, 237, 1197 (1987) & *C & EN*, 9/7/89, p. 30)

MICROALGA FARMS CAN COMBAT CARBON DIOXIDE EMISSION AND GREENHOUSE EFFECT

Scientists are finding that microalga farms can help minimise CO_2 emissions and combat the greenhouse effect.

Researchers at Solar Energy Research Institute (Boulder, CO) say that microalga organisms consume CO_2 up to 20 times faster than conventional crop plants per unit of land area. The microalga then can be converted to liquid fuel or as used as a source for oyster food, pharmaceutical and pigments.

Dr. Lewis Brown, SERI project leader, says that trapping CO_2 in micro-alga treated flue gas filters at coal plants and burning microalga-derived fuel will cut net CO_2 emissions in half because we are burning it twice.

He estimates that installing microalga farms on 1% of the arid land in Arizona and New Mexico would provide a full product ammounting to about 6% of the total US petroleum needs.

'Our calculations show such a system would consume 160 million kg of CO_2 annually, which equals 3.2% of the total US CO_2 emissions'.

SERI scientists are conducting experiments on 2.25 acre microalgae ponds in Roswell, New Mexico. 'We have a fairly extensive collection of 1,500 organisms and we are focussing on the 10 best', Brown says. "We are doing genetic research and introducing DNA genes to enhance their properties' he adds. 'We are working to clone some genes for lipid accumulation' for improved biomass-to-liquid fuel performance. (*R & D*, 7/1989, p. 28)

BIONET DATABANK OFFERS SERVICES TO BIOTECH INDUSTRIES AND FINANCIAL INVESTORS

In response to a shift in the biotechnology industry from 'being research driven to being more market oriented' Steven Delco, President of Delco Scientific Resources (Fairfield CT), he has developed the Bionet Databank to match (or bring together biotech companies and potential financial backers.

Delco predicts biotech sales will hit $20 billion by the year 2000 AD though the number of companies involved will shrink considerably from the current 6000. Bionet will give investment companies information on biotech firms and their research products, and will supply the biotech firms with data on sources of capital -- including the government and merger, joint venture and acquisition opportunities. (*Chem Wk*, 11/15/89, p. 60)

BACTERIA CUT THE COST OF CLEANING UP PCBs

Canadian reserchers will soon start trials of a new method of destroying polychlorinated biphenyls (PCBs) using a 'cocktail' of microbes. Researchers at the National Institute of Scientific Research (near Montreal), have created a mixture of 25 bacteria that can destroy entire molecules of many of these pollutants at one-fiftieth of the cost of conventional treatments.

Provided the cocktail works as well in the field as it does in the laboratory, a commercial version of the process should be available in a few years time. PCBs leach into the soil around waste dumps, contaminating the earth water. At present the main me cleaning up PCBs involves bur soil -- a procedure which is th provided that the incinerator enough to burn the compound pletely. But it is expensive, eac ment costs Canadian $2000 (£10 tonne of soil. Canada has at le polluted sites with 90000 tonnes awaiting processing.

Alternatively, chemical metho extract PCBs. These techniques, rely on solvents and surfactant cheaper than incineration but they an additional, although less haza waste.

If the new microbial process development works, the cost to cle the contaminated soil could fall a as $40 a tonne.

The Canadian researchers st with strains of bacteria that they iso from the soils near sites where P were stored. These bacteria, which collected in large numbers, were alr breaking down a variety of chlorin biphenyls, but very slowly.

The researchers at the Inst adapted these microorganisms to on PCBs more efficiently. In orde do this they used conventional bree techniques and genetic engineerin

Spraying the cocktail into the e ronment would not be practical, re researchers. PCBs which are oily, etrate deeply into the soil and the teria would have to be well mixe work effectively.

As an alternative to spraying, researchers are considering washing soil with surfactants to extract PCBs, then treating the resulting lic in aerated lagoons.

In the laboratory, the cocktail bre down either partially or completely two most common PCBs in the e

ment, achlor 1242 and achlor 1254. the bacteria have to survive in suf-ently large numbers to be effective he field. The Canadians want to elop microbes that will digest achlor 0, the most highly chlorinated PCB the most difficult to destroy.

The Canadians are not alone in their earch. Scientists at General Electric's rporate Research and Development boratory at Schenectady, New York, ait approval from the U.S. Environ-ental Protection Agency to test other strain outdoors on a highly pol-ted site at Woods Pond, Massachu-tts. Their powerful strain, which needs aerobic conditions and with the addi-on of nutrients, can attack even achlor 260. (*New Scientist*, 10/7/89, p. 34)

OTTING ENZYME BAFFLES IOLOGISTS

A fungal enzyme that rots wood once romised poor countries a better way of roducing feed for livestock from straw nd other by-products of crops. Five ears later, scientists are still baffled by ow the enzyme works.

The white-rot fungus Phanerochaete hrysosporium, makes an enzyme called ignin ase. The enzyme breaks down ignin, the building block of wood. Once legraded, molecules of cellulose and emicellulose, rich in energy become available to the fungus.

Recently, researcher Pat Harvey at Imperial College, London (UK) has shown that the enzyme is ineffective on its own. Mixed with lignin, it either does nothing or begins to work on the phen-oloic side groups in the lignin.

Once it has released enough of the lignin monoimers, however, it begins to catalyse their polymerisation back into lignin. This is a circular and useless abil-ity from the point of view of a cow that wants to get at the cellulose in the straw.

The fungus prevents this feedback inhibition in some way. Mixed with the fungus, the enzyme breaks down the lignin, suggesting that the fungus pro-vides the enzyme with either the micro-environment or the co-factors that it needs to work. Unfortunately, the fungus is of no use on its own because it destroys the cellulose as well as the lignin, leaving the cows with an even poorer quality feed. (*New Science*, 10/14/89, p. 32)

A TOXIC AMINO ACID IN FALSE SAGO PLANT LINKED TO GUAM DISEASE

A rare amino acid called L- α -amino -methylaminopropionic acid (MeDAP) has been linked by recent research as the cause of Guam's disease. Guam's dis-ease is a neurological disease causing degeneration of brain and spinal cord; leading to dementia, paralysis and death.

The nut of the false sago plant has one deadly component, that is not found on proteins, called L- α -amino- β -methylaminopropionic acid (MeDAP). Recently researchers at the Albert Ein-stein College of Medicine (New York) have shown conclusively that Guam's disease is caused by a diet containing MeDAP.

The mechanism of action of MeDAP was recently elucidated by the research group of Ledie Pettit of the Univ. of Leeds (UK). These researchers found that the toxin MeDAP is an avid sca-venger of the essential minerals Cu and Zn. These metals are normally present; complexed with glutamic acid in the central nervous system.

Chemists generally regard these complexes as being very stable. They have shown that MeDAP can wrest Cu and Zn away from the glutamic acid and bind the metals to itself more strongly. A lot of MeDAP in the diet or a small intake over many years could deactivate enough of these essential metals to cause permanent damage to nerves. (*New Science*, 10/7/89, p. 31)

BIOTOXINS FROM MYCOGEN TO BE PATENTED

Mycogen Corporation's scientists have discovered novel strains of the bac-teria Bacillus thuringiensis (Bt) that are toxic to plant parasitic nematodes. Myc-ogen researchers have developed a test that is capable of identifying Bt biotox-ins effective against these pests. Patents have been filed covering the discoveries.

The biotoxins discovered by Mico-gen researchers will most likely reach commercial markets in plants genetic-ally engineered to be resistant to the pests. Plant parasitic nematode control represents a potentially significant market with a clear need for alternative technologies. A recent survey by the Society of Nematologists found plant parasitic nematode damage exceeds $77 billion annually.

The most common control measures for plant parasitic nematodes are tradi-tional plant breeding and chemical nematicides. However, traditional methods of breeding nematicide-resistant plants involve long and com-plicated processes.

Chemical nematicides can be toxic to mammals and other wild life and have been implicated in groundwater contam-ination. In addition, nematodes have built up resistance to many chemical nematicides.

According to researchers biological nematicides promise to overcome the disadvantages of synthetics while revo-lutionizing selective breeding techni-ques. The company is promising a colla-boration with a company that has strong plant genetic engineering technology.

Earlier this year Mycogen research-ers developed several novel strains Bt toxic to parasitic nematodes in livestock. This was the first evidence that Bt toxins have animal health applications. (*CMR*, 9/18/89, p. 35).

Food & Pharmaceutical Technology in Perspective (Part 2)

ORLDWIDE AQUACULTURE DUSTRY IN PERSPECTIVE

Aquaculture or fish-farming is of ent significance in world's food nomy. From its modest beginnings the 1960s, aquaculture has today come the fastest growing sector of the otein foods the world over. By all counts, the global aquaculture indus- is booming. It is one of the fastest owing areas in the food industry even USA and the fastest expanding area the gargantuan US agriculture.

Worldwide aquaculture production of nfishes, crustaceans and molluscs rose om an estimated 6.6 million tons in 975 to about 10 million tons in 1988, increase of over 50% in 8 years. By 000 A.D., the world aquaculture indus- y is likely to harvest over 21 million ns, representing a 100% increase over urrent output. It is estimated that one- uarter of the world's consumption of afood in the year 2000 A.D. will come rom aquaculture. The tiger prawn, the ueen of the crustacean sea food grown y aquaculture will offer an envious window to profits on an international cale.

The aquaculture industry in Asian countries is already enormous in real- ty and scope. There are an estimated 8 million hectares in production for coastal aquaculture activities in Asia. Some 16 Asian nations including India, are responsible for producing about 19% of the world's aquaculture pro- ducts. The leading Asian countries in this field are Japan, Korea, Taiwan, Thailand, and Malaysia. The aquacul- ture industry in Japan, Taiwan and Thai- land should increase much faster than in still developing nations such as China and India, because consumer's diets in the lesser developed countries are still switching from grains to meats. How- ever, due to the enormity of the poten- tial for aquaculture in China and India these countries could prove to be a most important market for long term growth of fish farming products.

Behind Asia, Western Europe repre- sents the second largest aquaculture industry. Much of the European aqua- culture industry is in mollusc produc- tion, but for the future growth it will be the trout and salmon fish-farming that are most significant. Western Europe has some of the most advanced inten- sive fish farming operations in the world, particularly for salmon and trout farming (which is dominated by Norway).

The Latin American, African and Eastern European aquaculture industries are relatively smaller in stature at present but are poised for exceptional growth in the near future.

This worldwide explosive growth in aquaculture offers enormous opportun- ities in future to producers of feeds; feed additives, drugs, vaccines, diagnostics and growth hormones. Feed is a high value item in aquaculture, and top prices are paid for premium products. Fish itself has a higher value item/lb than most other livestock and many aquacul- ture producers are willing to invest more money/fish lb on better quality feeds than other animal producers. This is especially true in the USA, Western Europe and Japan. By 1990 A.D, the worldwide aquaculture feed market is expected to exceed 4.3 million tons and be worth over 21 billion dollars. The market is expected to triple in the 1990s, with sales of over 14 million by 2000 A.D.

Although, India is also making pro- gress in aquaculture, one wonders whether there is any awareness in India about the development of feeds for fish farmings and the enormous opportuni- ties awaiting the export of feed for aquacuture to neighbouring countries. *(ECN, 9/18/89 p. 18-27).*

AQUACULTURE OPENS UP NEW OPPORTUNITIES TO PRODUCERS OF FEEDS, FEED ADDITIVES, DRUGS, DIAGNOSTICS, VACCINES AND GROWTH HORMONES

The explosive growth in world aqua- culture has created in recent years a new vista of opportunities in feed, chemical, pharmaceutical and other related fields.

By all accounts the global aquacul- ture industry is booming. It is one of the fastest growing areas in the food indus- try and the fastest expanding area in U.S. agriculture. It is estimated that one-quarter of the world's consumption of seafood in the year 2000 A.D. will come from aquaculture (fish farming) amounting to over 21 million tonnes per annum.

These statistics translate into burge- oning feed market, which has risen from an established 1.7 million tonnes in 1980 to over 3.6 million tonnes in 1986. Asia and Oceania assume almost half of the market with those of the other half going to farmers in West Europe and USA. By 1990, the worldwide aquacul- ture feed market is expected to exceed 4.3 million tonnes and be worth over $21 billion. The market is expected to triple in the 1990s with sales of over 14 million tonnes by 2000 A.D.

Expansion in aquaculture clearly depend on the availability of better feed. Major areas within the aquaculture feed industry include markets for fish meal, soybean substitutes, fish pigmentation, delivery systems, vitamins and miner- als, in-feed medications such as antibio- tics, and a range of several feed ingredients and additives.

An increasing number of animal feeds firms in affluent countries, not traditionally involved in aquaculture feeds, are now realizing the tremendous opportunities in this area. Vertical operations that include their own R & D and production of aquaculture feed, the management of fish farms and even fish processing plants are becoming more common as businesses take advantage of the profits available in all levels of the aquaculture industry.

The industry is luring such diverse investors as chemicals, food, tobacco, public utility, oil, insurance, construction, pharmaceutical, biotechnology and crop agriculture firms. Although investors are entering the industry, the markets are still very open, particularly internationally.

The agriculture industry in Asian countries is enormous. There are an estimated 8 million hectares in production for coastal aquaculture activities in Asia. Some 16 Asian nations are responsible for producing about 79% of the world's aquaculture products and therefore offer an attractive export market for aquaculture feeds.

Aquaculture feed manufacturing in most Asian nations has been severely restricted because of the lack of capital and technological know-how. This is particularly true for China and India. Such areas are, therefore, likely to rely heavily on imports of aquaculture feeds, and joint ventures with foreign firms, to satisfy their domestic markets.

The majority of aquaculture producers in developing nations use farm by-products and pond algae to feed their fish and shellfish. It will take substantial marketing efforts to convince them that the use of costlier commercial pre-mixed aquaculture feeds result in higher productivity and better profits.

Western Europe (EEC countries) also offers the second largest aquaculture feed market after Asia. The trout and salmon markets are the most important to aquaculture feed manufacturers. Europe has some of the most advanced intensive operations in the world, and the demand for the highest quality feeds is unparalleled. Salmon and trout farming is dominated by Norway.

Business opportunities are exceptional in the rapidly expanding North American feed market, particularly for E.E.C. countries for the export of aquaculture feeds.

Two new areas for development in aquaculture are 'therapeutics' and 'diagnostics'. Aquaculture production can easily be jeopardized by disease, especially in intensive systems where, just like in livestock and poultry production, crowding is both a source of stress and can facilitate the spread of infection. Aquaculture producers undergo major economic losses due to disease.

More and more veterinary drug companies and pharmaceutical concerns are turning their attention toward the development of aquaculture therepeutics to meet growing demand. The presence of disease may be the most prohibiting factor in the growth of aquaculture worldwide. Tremendous opportunities are foreseen to feed and pharmaceutical companies investing in the R & D of the feed and water applied medications for aquaculture.

Leading authorities in livestock and poultry feed additives see aquaculture as the next wave of growth in the industry. The feed and pharmaceutical firms who are already involved in developing and producing feed additives for livestock and poultry are in a good position to transfer technology to the aquaculture sector. While traditional markets are growing moderately, aquaculture can provide the key to boosting sales.

The principle drawback to registration of aquaculture drugs and accessories has been the lack of major species in aquaculture as compared mammalian livestock. Howeve that aquaculture farming has b such an important economic forc global food sector, a great amou & D activity is beginning among competing to capture their own sh the aquaculture therapeutics ma

Fish farmers also need reagen would allow for the rapid diagno diseases. Effective on-site diag tests are badly needed to detect ses at their earliest stage. Over 17 panies are involved in aquac diagnostics in advanced countrie

Antibiotics, in recent years have increasingly used in aquaculture to trol the diseases. The antibiotics monly given to fish include sul trimethoprim, furazolidone, oxyt cycline and oxolinic acid. Ma microbes can develop resistance in same way as mammalian organis This resistance is transferred su quently to human pathogens. This lead to government restrictions on use of antibiotics in aquaculture.

One way around the problem of a biotics could be through the use of v cines. Vaccines will become an inte part of aquaculture in the near fut There are still dozens of major dis ses for which vaccines are gre needed. For example in Scandina 80% of the salmon and trout have b vaccinated in 1988.

In-feed medications is another imp tant area for aquaculture feed manu turers. Aquaculture farmers gener use a premix cocktail of ingredients includes vitamins, trace elements, m erals, amino acids and medications add to aquaculture feed.

Some products also contain an ap tite stimulant to promote feeding. M ications that are actrive against a w range of gram-negative organisms, c sing bacterial diseases of farm fish crustaceans are especially importa

Some companies in USA and Japan endeavouring to grow algae in quantes large enough to market as natural uaculture feed additives. In one velopment, researchers are trying to algae to produce salmon's pink lour, rather than through chemicals.

The use of growth hormone is other potent factor in aquaculture. hough it is too early to say with any rtainty how much impact the use of rmone to enhance growth will have aquaculture, the potential advantages ppear enormous.

Altered fish may keep eating and rowing during the winter months when ost normal fish are dormant. If so, the enetic alteration might allow aquacul- re farmers to shorten the time it takes o produce full grown fish. (*ECN*, /18/89, p. 18-30)

CHITOSAN POISED FOR GROWTH IN PHARMACEUTICAL COSMETICS AND DENTISTRY

Chitosan is a common name for all forms of partially deacetylated chitin (main constituent in the shell of crustaceans). While the final product is soluble in weak acids. Industrial production of chitosan started in Japan around 1970. Outside Japan, industrial volumes are today manufactured in USA and production and development is going on in several other countries. As a derivative of chitin, the raw material situation for chitosan production is seen as good. Chitin is the most plentiful biopolymer next to cellulose.

A variety of applications has been proposed and tested with chitosan in recent years. The Table 1 below gives a bird's eyeview of the major applicatios in cosmetic and pharmaceutical fields, together with salient functions of chitosan. Today the term chitosan is used as a common name for all forms of partially deacetylated chitin, where the final product is soluble in weak acids.

Table 1

Major Cosmetic/Pharmaceutical Applications of Chitosan on the horizon

Applications	Functions
1. Immobilise enzymes/living cells	Gel immobilisation matrix increase stability, compatible with phosphates.
2. *Personal Care Products*	
Hair care	Substantive to hair and skin.
Skin care	Form clear protective coating, moisture retention.
Viscosifier	Build viscosity in amphoteric/non-ionic shampoos.
Cosmetics	Viscosity building, coating, moisture retention, non-allergenic.
3. *Biomedical*	
Lower Cholesterol	Anti-cholesteric
Wound care	Accelerate wound healing
Eye bandages	Forms tough protective coating, biodegradable.
Drug delivery	Bioerodable, non-toxic.
Contact lens	Cross linked to give porous grindable lens material, non-allergenic.
Dental	Bio-adhesive.
Absorbable sutures	Biodegradable, accelerate wound-healing.
Orthopaedic	Temporary bio-engineering material.
4. *Biotechnology*	
Immobilised enzyme	Complexes with proteins.
Immobilised living cells	Forms gel matrix (e.g. beads).
Encapsulate cells	Replace polysine in algin bead process.
Filtration	Membranes can be cast; film.
Recover valuable protein	Complexes with protein flocculate.
Chromatography	Support enzymes/cells stabilisers.

Quite a large number of derivatives of chitin and chitosan have also been proposed and prepared by several laboratories in USA and Japan. Retaining the properties of chitosan in a solution of neutral pH is one of the objectives of making derivatives, another is to improve or combine new effects with the existing properties.

Even though the solubility of chitosan is limited to an acid environment, the acid solution of chitosan has many interesting properties. In acid solution chitosan behaves as a pseudoplastic material.

The main application of chitosan in cosmetics has been so far in haircare, with many shampoos and conditioners containing the product already for sale in Japan, USA and Europe.

The advantage of using chitosan in such products is further based on its ability to form films with proteins. Compared with synthetic polymers, the chitosan film is more stable at high humidity, having a lower tendency to adhere.

It has further been found that hair treated with chitosan is less statically charged during brushing and combing than hair treated with traditional hair fixers. Another important aspect is that chitosan does not contain harmful monomers from any polymerisation step and is regarded as physiologically safe.

Other applications where development work is going on with new products expected to be released in the market abroad soon are:

* Encapsulation of fragrance, pigments and active ingredients.
* Special grades of lotions.
* Humectants.
* Dental products for cavities protection and wound healing.

The most potential pharmaceutical applications will be in wound-healing formulations, eye care products and drug-delivery systems. Related to cosmetics the wound healing/synthetic skin applications will probably be the closest to marketing.

The haemostatic effect of chitosan is explained as a crosslinking/repolymerisation reaction between the membrane of the red-blood cells and chitosan. Applied on dressings or by chitosan coating of vascular grafts in surgery, this effect has been tested out emperically.

Interesting areas of potential, where chitosan can have a combined tic/pharmaceutical role, includ ducts like after-shave lotions, a for treatment of damaged skin, s etc. (*Mfg. Chemist*, 10/1989, p.

MODI

For competitive imports of:

Alpha Naphthol
Antimony Oxide
Antioxidants (SUNNOX 10 & 76)
Benzophenone
Beta Naphthol
Bisphenol A
Chrome Sulphate
Citric Acid
Coumarin
Cumidine (Para)
2-Cyano 4-Nitro Aniline
2-Cyano Pyrazine
Cyano Pyridine (3/4)
Cyanuric Chloride
2,6 Dichloro Aniline
Dicyandiamide
DV Acid
Ethylene Glycol (Mono/Di)
Ethyl Iodide
Formic Acid
Glycerine
Indolinone
J Acid
Lactic Acid
Maleic Anhydride
Methylene Chloride
Oleopine Resin
Phenol
Phosphoric Acid
Phthalic Anhydride
Picolines (Alpha/Beta/Gamma)
Polyacrylamide
Polyvinyl Alcohol
Potassium Carbonate
Propiophenone
Sodium Bichromate
Soya Lecithin (Deoiled powder)
Tannic Acid
Thiourea
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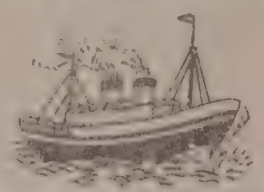
STEAMER  BRA

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arket survey in Chemical Industry — Problems and Limitations

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he most difficult aspect in taking investment decision with rd to the chemical projects appears to be the assessment lemand potentials for chemical products in the country. problem has become particularly difficult, since orga- d, reliable and upto date information and data are not read- available. Even established consultant organisations with quate background and facilities, find it extremely diffi- t to provide quick and reliable assessment of the market nand situation for the chemicals. It is sad that even the port data for the chemicals cannot be obtained readily. A journals publish every week the import details of chem- ls in the Madras and Bombay ports. They appear to col- t informations from the import bulletins made available the Bombay and Madras ports. In the case of other ports e Calcutta, Vizag, Cochin, such import data are not read- published for the benefit of the industries. There is also organised publication of import details of chemicals trans- pped by air. The authoritative import data on chemicals by e Government sources are published atleast 12 to 14 months er the imports. One can understand the plight of those seek- g to assess the supply situation in the country for products such circumstances. Normally, the market assessment for emicals and other products are carried out in three phases mely exploratory desk research, contact programme by cor- spondence and personal interview with the traders, con- mers and producers. After the collection of all this formation in an organised manner, they are subjected to alysis and evaluation to reach conclusions and quantify the emand/supply figures.

The exploratory desk research can be carried out effectively high quality levels, only if one keeps track of the develop- ents in chemical industries for a length of time. It is imper- ive that the information made available by experts in chemi- al industries from various functions from time to time, col- cted and kept in a systematic way in a well documented brary, for easy access to vital information, should be avail- ble at the right time, to those seeking to do a market study. is doubtful as to whether any such product based docu- entation and information, in the field of chemical industry nd chemical products with regard to various aspects, are ade- uately maintained by any library or agency in the country. What is generally available is the volumes of a few chem- al journals which are bound and kept in the shelves from me to time. In such situations, the exploratory desk research o assess the demand-supply situation for chemical products ecomes a very difficult, time consuming and a frustrating xperience. The available information is also not often fool- roof. Several instances can readily be cited, when two dif- erent journals provide two different information on the same products. The assessment provided by the Government of India and DGTD on future demands for products are also often proved to be very unreliable. For example, the official estimates for octanol demand in the country in 1990-91 is 35,000 tons; but actually the imports of octanol in the country in the entire 1989 from the published data, appears to be just around 1000 tons; with the indigenous production being only 10,000 tons. Many other examples can be cited. It is the general experience of market survey consultants that when they approach the producers, consumers or traders in chemical industries for information, there is tremendous level of reluctance on their part to provide vital information and statistics. When thousand letters are sent seeking information, one should be lucky to get more than 70 to 80 replies. This is no exaggeration. Even for personal interviews, many organisations and persons extend little cooperation. Under such circumstances, the market survey agencies are forced to adopt clandestine methods and techniques to get information from organisations, with regard to the consumption details and future requirements for products. A market survey specialist has to be not only an expert with regard to the chemical industry scenario, but also should have expert PR qualities and personal charisma to collect information.

A good market survey assignment would be more reliable if it were not to restrict itself to mere collection of figures. It should seek to establish the relevant and important factors namely the feasibility of the product becoming obsolete, the relevance of the product to the country's economic and industrial development, availability of the optimum technology to produce products at competitive price, the nature of trading practices adopted and the 'cultural segment' in which the product would fall. A mere assessment of the present gap in the supply situation by itself cannot provide adequate guidelines, in the absence of the above information. The assessment of demand potentials for chemicals have become such a highly complex job that the persons concerned with the investigation require exposure to process management, technology assessment, product applications, sales promotion and managerial judgement. In Indian conditions, where statistics are only partly reliable and multi various factors affect the situation, it would be unsafe for the market survey agencies to attempt to quantify the demand potentials and supply gap for any chemical in precise terms. Such an attempt would lead to undermine the credibility of the work carried out. A definite indication of the relevance of the product to the country's growth pattern and the trend of demand potentials should be considered adequate in such circumstances. This should be considered as a more honest approach, than demanding that the market survey consultants should indicate precise figures of growth, ignoring the constraint and limitations facing them.

Biotransformations: the challenge and the rewards

ANNE-MARIA BRENNAN
Durrell Institute of Conservation and Ecology, University of Kent, Canterbury.

The recent upsurge of commercial interest in the potential biological systems to achieve highly specific chemical reacs reflects the success of results so far gained from research development in protein sciences, genetic engineering and ymology. Biotransformations, as they are now known, are ening up new opportunities in areas ranging from chemls, pharmaceuticals and the treatment of waste to food and iculture. Just how valuable the rewards of future research mise to be is evinced by a programme funded equally from Government sources on the one hand and on the other eleven major companies, up to a total of £4 million. The st phase is already underway with the setting up of a £1 llion Inter-University Biotransformations Research Centre.

Biotransformation systems can achieve many ends, procing novel chemicals with highly defined structure and a gree of purity that cannot be attained by more traditional chniques. In some ways they are an answer to the alchests' dream, converting cheap materials into highly valued oducts. The area of research is exciting and challenging, th considerable potential for the shaping of synthetic chemry.

The importance attached to this field can be gauged by collaborative programme involving the scientific commun- and industry, funded jointly to the tune of £4 million by e UK Department of Trade and Industry and the Science d Engineering Research Council on the part of the Govnment, and by industry itself, public and private support ing agreed on a fifty-fifty basis. It is one of many such ogrammes across the broad field of science and technogy under what is known as the LINK initiative, which ccusses on advances in science and engineering with parular commercial promise and is intended to stimulate colboration between industrial and science-based partners in y areas.

First step in the programme has been to set up an Interniversity Biotransformations Centre. The word Centre in e title is not used in the sense of a building or a geographal nucleus; it describes a concentration of expertise at the niversities of Exeter, Kent and Warwick, with the stated oject aim of investigating the use of enzymes as catalysts r fine chemical manufacture, especially for the pharmautical, fragrances and polymers industries.

lose co-operation

Industrial participants are Beechams, BP, Courtaulds, Eli lley, Enzymatix, Glaxo, ICI, International Bio-synthetics, Pfizer, Shell and Quest International (Unilever). Collaboration between industry and the academic community is not a new idea, for the pharmaceutical and agrichemical industries have, in the course of their extensive background research and development, worked in close co-operation with universities and other institutions. The 'LINK' initiative extends this level of collaboration, allowing smaller, specialist companies as well as larger ones to have access to all the advantages available in collaborative research. Added to this is a management structure within the scheme which helps co-ordinate the research within and between the participating organisations, ensuring that resources are used efficiently.

Biotransformations are chemical processes carried out by enzymes, biological catalysts produced by living cells. Like ordinary catalysts, enzymes enable a reaction to take place yet themselves remain unchanged.

Enzymes function in a number of ways, generally acting as the workbench on which cellular chemistry is carried out. They are proteins, which have a complex chemistry and inherent flexibility that enables them either to bring chemicals together to build large macromolecules or to separate them, breaking large molecules down. Their activity can be switched on or off, according to the cell's needs. Operating within the cell, they act on low concentrations of a starting material, known as the substrate, and convert it into the finished product.

Nature's chemical engineers

Enzymes have a very subtle chemistry, catalysing the chemical processes of life in a stepwise fashion, they have to do this, because the amounts of energy locked within the reactions are so great that an uncontrolled reaction could easily destroy the cell. Enzymes tame these processes, carefully co-ordinating the construction and dismantling of various molecules. In this way they act as nature's own chemical engineers, controlling and regulating the biochemistry of the cell.

Here at the University of Kent, Professor Chris Knowles and his team are no strangers to biotechnological research involving biotransformations, for they developed a process in the micro-organisms used to detoxify organic cyanide.

The technique was based on the ability possessed by many species of plants, fungi and bacteria to produce and detoxify cyanide under natural conditions. This characteristic is widespread in the living world: important crop plants such as

cassava and sorghum are well known for their ability to produce cyanide yet remain unharmed. A fungal disease of sorghum Gloecercospora sorghi was found to be capable of living on cyanide-producing tissue, because it produces cyanide hydratase, an enzyme able to convert the highly toxic cyanide to less harmful formamide by the addition of water:

$$\underset{\text{Cyanide}}{HCN} + \underset{\text{Water}}{H_2O} \dashrightarrow \underset{\text{Formamide}}{HCONH_2}$$

The team investigated a series of organisms and discovered the fungal tissue of Fusarium lateritium to be a rich source of cyanide hydratase, which was able to operate in high and low concentrations of cyanide to completely detoxify the hazardous compound.

Commercial implications of this discovery were obvious: cyanide is widely used in the chemical industry in the production of paints, plastics and electroplated metals, and is frequently an unwanted by-product in many other industrial processes including the manufacture of coke and steel.

Because the ability to detoxify cyanide by the use of cyanide hydratase was shown to be of considerable potential value, Knowles and his team collaborated with ICI who then went on to produce a commercially available system. An enzyme-rich dried fungal concentrate is currently marketed by ICI Bio-Products Business under the tradename CYCLEAR. This innovation won for ICI the 1984 Royal Society Pollution Abatement Award.

Selecting bacteria

There have been a number of other spinoffs from the research programme, designed to identify and isolate micro-organisms (and their enzymes) capable of detoxifying industrial effluents. The major challenge of the work lies in selecting bacteria which continue to work in the hostile environment of concentrated effluent and are able stand conditions that often are bactericidal.

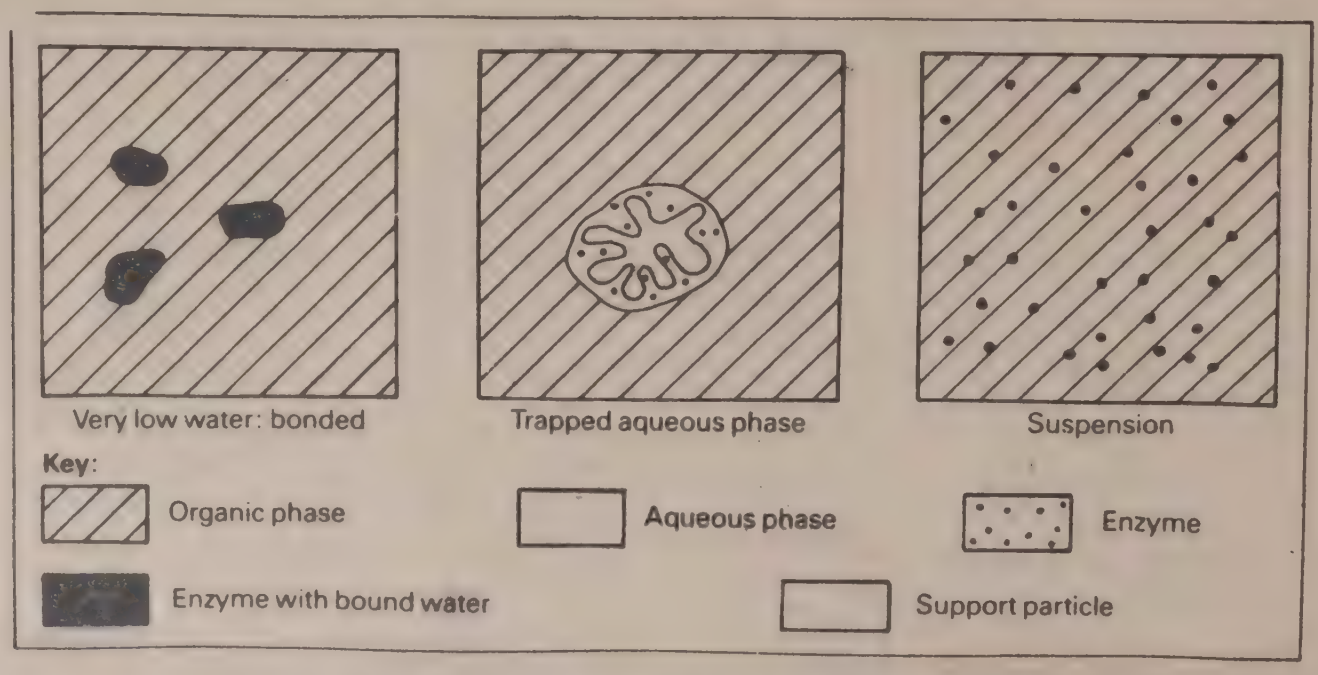
Another characteristic feature of enzymes is that t play specificity for one or a few related compounds able to convert them to a wanted end product. In th enzyme action differs from traditional catalytic che where processes are relatively non-specific and under reactions which result in unwanted by-products ofte cult to eliminate. These by-products may undergo reactions and combine to form inconvenient tarry d within the reaction mixture. This may damage the ap and may reduce the reactions themselves to somethi hit and miss affair, with variable efficiencies and ext low yields. At the very worst it may ruin the proc making the end product inseparable from the reaction m

In some cases enzymes can achieve results that are n sible by other methods of synthesis. Important drug as antibiotics and beta-blockers can be altered to improv effectiveness by slight changes in their chemical stru Some of these alterations can be carried out only by bi formations, because they require accurate, piecemeal ical changes characteristic of enzymic action.

High stakes

In financial terms, the stakes are high in the prod of so-called fine chemicals, specialist compounds tha to be produced in relatively small amounts with a high d of purity. Such a requirement makes the use of enzym the required reactions economically sound.

Biotransformations can also be used to produce comp that are free of contamination. This is particularly imp in the pharmaceutical and agrichemical industries, unwanted toxic contaminants may persist even after treat



Diagramatic examples of two-phase biotransformations systems

xample of this is seen in 2,4,5-T, a herbicide based on nthetic plant hormone, where the active ingredient is con-nated by small but significant amounts of dioxin, one ne most toxic chemicals known. These problems could liminated by the use of biotransformational systems to duce similar but uncontaminated compounds that could the same job.

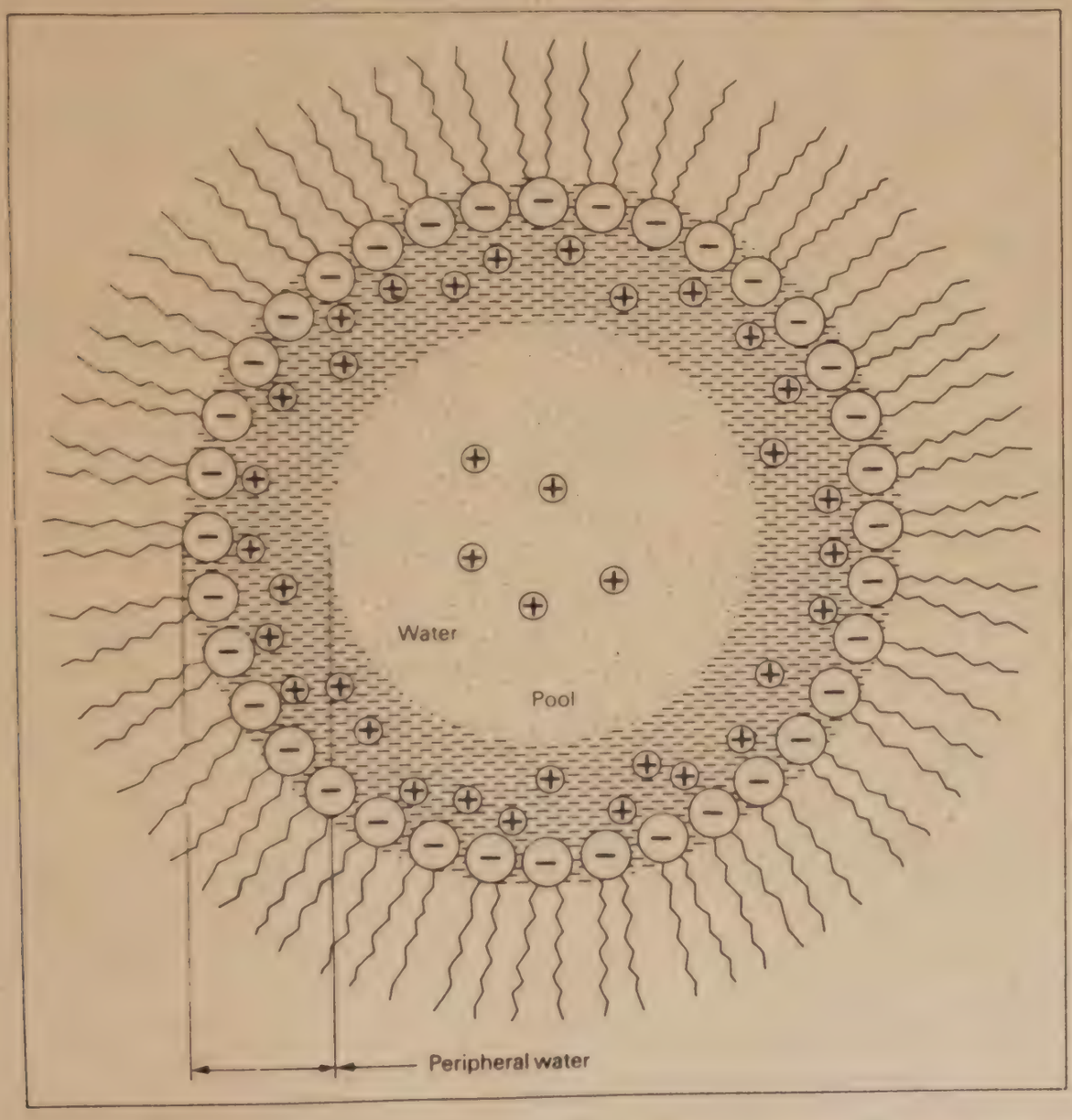
uch safety considerations are of prime importance in the nufacture of pharmaceuticals, where contamination is a re complex issue involving not only foreign chemicals but ferent forms of the same molecule. Many molecules have ntical formulae and similar structures, differing only in ir form and symmetry, one being an exact mirror image the other. In nature, this 'handedness' of molecules can vital in their ability to function. Proteins for example can ly be built out of 'left handed' amino acids (L-amino acids), nile naturally produced sugars tend to take their 'right nded' (D-) form.

Introducing a compound in its wrong form can be met with either an inconvenient lack of response or more fundamental catastrophic failure. The dangers of this were highlighted in the late 1950s, in the tragic consequences of using the drug thalidomide. In one form, the drug produced beneficial effects, whereas its mirror image caused disastrous birth defects.

By using biocatalysts, products can be produced exclusively in either their left or right handed forms, which is not possible using traditional synthetic techniques. Such precision allows drugs to be produced in a known form, tailored to individual requirements with a level of efficiency that makes such processes economically sound and desirable on grounds of safety.

Organic media

For all these advantages, such as specificity, accuracy and precision, there are a number of drawbacks which have until recently made the use of biotransformational technology unat-



In a micro-emulsion droplet, a water pool is surrounded by a spherical monolayer of surfactant molecules, with their hydrophobic tails pointing outwards into the organic solvent. The enzyme is contained within the aqueous phase in the centre of the droplet.

tractive on a large-scale commercial basis. Many industrial processes use compounds that have a poor solubility in water, such as those used in the petrochemical industry. Because of this, synthetic chemistry is often carried out in organic solvents containing high concentrations of reactants. Water is regarded as a bulky complication to any process, expensive to remove from the mixture by evaporation. The conditions prevalent in 'traditional' chemistry have long been considered to be incompatible with the requirements of biological systems which, by virtue of their evolution, operate in a predominantly chemically dilute, aqueous environment at temperatures below 45°C.

However, it is now apparent that this need not be the case, for a number of enzyme controlled processes work well within organic media. Research in this area has produced a series of exciting breakthroughs in the technique of doing enzyme-based work in organic solvents. There are a number of ways in which this can be achieved. Possibly the simplest technique is the use of slightly 'damp' enzyme; investigators have discovered that such 'nearly anhydrous' enzymes can do their job in surprisingly little water, forming a suspension within the organic solvent.

In another method, water is chemically bonded to the enzyme using a coating of a bonding compound such as polyethylene glycol, well known for its antifreeze properties. Water molecules stay tightly bound to the enzyme and enable it to function while in the organic media. Water can be bound to an enzyme in other ways: one example of this is the use of a gel-like material to trap the aqueous phase and allow the enzyme to operate within an environment conducive to its natural mode of action.

Single phase

While the above methods can be viewed as two-phase systems, there is a further technique which allows the reaction to operate as a single phase. Certain microemulsions investigated by Professor Robert Freedman, a colleague of Professor Knowles, are composed of extremely fine droplets of water which, once dispersed in oil by the use of a detergent-like surfactant, give a clear solution. The water droplets are of molecular proportions, millionths of a millimetre in size, and are just large enough to accommodate a single enzyme, stretching slightly as they do so.

In the development of systems that allow biotransformations to be carried out within organic solvents, a number of advantages have been observed. One benefit is a shift in equilibrium which occurs when certain water-based processes operate in organic media. In some instances, hy enzymes that are otherwise destructive have been sh work backwards: proteases originally designed to brea proteins actively build them up out of amino acids. Th nomenon has considerable potential because it enab reactions to be catalysed by cheap, readily available en which, while running backwards, can be used to syn more complex, costly molecules out of relatively simp in a fast, energy-efficient way.

The enzymes themselves can be protected from any up of reactants which might otherwise inactivate the shunting the products of the bioconversion into the o phase where they remain isolated from the enzyme. T way the organic phase of the reaction system can behav as a sink, removing the product from the aqueous phas as a reservoir of the starting material, supplying it t enzyme.

Use of a two-phase system lends itself well to being s up for use in the commercial production of biotransfo molecules such as pharmaceuticals, agrichemicals, fla ings, fragrances and dyestuffs. Reaction systems ca immobilised in materials such as hollow, semi-perme fibres that allow the finished product to be recovered ciently from the reaction mixture.

A number of chemical companies have carried out ex sive research in these areas. Unilever UK and the Fuji Company of Japan have both developed biotransforma systems in which cocoa butter can be synthesised from r tively simple oils, including palm oil. In this way an exp sive commodity much sought-after in the confectionary t can be produced from cheaper ingredients by biotrans mational techniques.

It is the great commercial value of these development biotechnology that has led to an increase in research activ Work at the Inter-University Biotransformations Centr being carried out in close co-operation with the compa that have helped fund the research. At Kent, the research te is continuing its search for new, useful enzymes that can used either in the form of entire organisms such as bact or as isolated enzymes. Organisms which are seen to p duce enzymes capable of processing unusual materials, c verting them into harmless or valuable compounds, are be isolated, identified and examined for their ability to ope under a broad range of conditions.

Courtesy: Spectr

Ethyl alcohol production in India -- some observations

S.L. VENKITESWARAN

Ethyl alcohol, referred to by general practice in India rely as alcohol, is the gift of the sugar industry in India ough the waste or by product after sugar crystallisation r several stages molasses.

It is generally 4% on sugarcane or 40% on sugar on average d results in a production of 220 to 250 litres of alcohol tonne depending on its total sugar content. This is about % of the theoretical yield and can be raised to 91% or more ough improved systems of fermentation. Over the past 15 ars there has been a spectacular rise in our sugar produc- n to a level of 9 million tonnes and the target for the 8th an is likely to be set at 12 to 13 million tonnes-in turn result- g in over 5.2 million tonnes of molasses. The use of molas- s other than for alcohol is so small that nearly 80% has to be nverted into alcohol over 1000 million litres. Quite a large rt of this needs to be used as a base for suitable organic emicals and the quantities are expected to go up by 8% so every year in line with the growth in sugar demand.

This is indeed a very fortunate situation for India. Syn- etic ethanol has taken over a large part of the demand in e western countries and fermentation alcohol is mainly for otable use. The industrial requirements of alcohol are much gher than the potential of production from molasses, of sug- rcane or sugarbeet. The chemical conversion of alcohol is ery little and in recent years the use as fuel for blends with otor gasoline has come into the picture. The production of thyl alcohol in USA for such fuel use is based on corn maize) and has reached levels far higher than India's output. Europe the alcohol is also derived from sugarbeets directly r from potatoes and prices in both USA and West Europe re much higher at 30 to 40 cents per litre. Waste molasses the cheapest source for alcohol and when linked to the sugar roduction from cane there is often the additional bonus of w cost steam at low pressure which could lead to low cost roduction.

Brazil is one country which has gone all out for alcohol s a fuel in automobiles and has reached a level of near 10 illion litres a year in over a decade. The alcohol production ; an alternative to sugarcane use for sugar and treated as a o-product of sugar with pricing of the two suitably adjusted. lcohol is paid for at the level of petrol prices but without ny taxation and when used for chemicals it is sold at 35% f the price of petroethylene. Cars are designed and made or use of neat alcohol. Although the policy was framed to educe foreign exchange outgo on oil imports the discovery f indigenous oil in recent years has caused some problems ut the policy is continuing. In the US the use of alcohol in otor fuels is more due to the clout of the farmers who find it difficult to sell their maize, besides environmental consideration and the TEL phase-out.

India's primary position as the top producer of alcohol from molasses also has its own problems. The very low price for molasses and coal in the early years of development the sixties, seventies and early eighties and the easy way in which alcohol is produced from molasses led to a virtual dependence on traditional technologies and no incentives for improvements. The main criterion was the cost of innovations vis-a-vis the savings in cost of molasses or steam consumed. This was heavily weighted in favour of traditional methods until the large escalations in price of molasses and coal from the early eighties. Also the justifiable outcry against the effluents after alcohol distillation has led to the search for process improvements. We have been singularly negligent on R & D and now again look to overseas sources for improvements but find that there is very little on offer. Molasses and steam today account for Rs. 1.7 to 2 per litre of 95% pure alcohol and the need to cut down on these two items is all important. Effluent treatment can account for an additional cost of 30 to 40 paise per litre but there is a return through energy generated in the form of biogas or combusion heat.

The Indian efforts on better technology is very limited and one of these is on the reuse of yeast to step up the efficiency of fermentation by 5 to 7%. the Indian process uses a flocculating type of yeast which avoids the need for centrifugal separation while an alternative approach from foreign sources uses higher concentration of the residuals after fermentation for yeast separation in a centrifuge. The merits and claims of these alternatives require in-depth analysis.

Another Indian effort has been on the use of cellulosic waste materials after hydrolysis by enzymes into glucose. The early developments were in the context of years of molasses shortage, which have now ended. The process on offer for scale-up is said to be for converting straw or corn cobs into alcohol. The economics and capital costs have yet to be evaluated. In this context we have to look at the question from a wider context. Bagasse is the preferred source of cellulose material for pulp and paper and it is also an annual crop residue. Our needs for paper and newsprint are much higher than what is possible to produce from our grass, bamboo and forest resources. The best way is to tap bagasse from sugar factories by providing alternate energy to them. Cellulose as a source of alcohol is not for this century but the pentosans associated with the cellulosic material can serve as a source of alcohol. The pentosans can be separately hydrolysed under mild conditions by acid without affecting the cellulose.

Another elegant process is the hydrolysis of bagasse by alcoholic alkali when non-cellulosic material gets dissolved leaving cellulose fibre for easy filtration. The solution can be processed for recovery of a pure grade of lignin and pentose fraction. NRRL of Peoria, USA, have carried extensive work on converting xylose to alcohol using a special strain of yeast-Sacch Tannophilus with good yields. India may not need to tap such alternative sources for two decades perhaps unless there is a major policy shift to generate liquid fuels from non-hydro-carbon sources.

Incidentally it may be mentioned that the spent wash containing the residual non-fermentables can be used to produce yeast of feed grade (Tourla utilis) or even the regular S. Cerevisia for fermentation. Such work was reported from France a long time back but circumstances then did not warrant such use.

Getting back to the subject of energy savings and better efficiencies there are a few lines of work in the USA which could be of interest for us. The vacuum fermentation is most promising. In this a part of the fermenting liquor is withdrawn into a flash chamber where vacuum sucks out the alcohol and the liquor is recycled back to the fermenter with the yeast cells intact and along with fresh medium. The vacuum derived vapours are compressed and rectified to get pure alcohol either by itself, or alongwith a separate stream from the fermenter taken for direct distillation. The vacuum flash enables the alcohol content of the main fermenter to be kept below levels which tend to inhibit the fermentation. The system is certainly worth a trial for wider adoption if investments are not unduly high and electric power is readily available.

The most important advance for saving in steam required for the distillation is through MVC-Mechanical Vapour Compression-heat recovery. The rect spirit vapours going for condensation can be compressed and used as the source of heat at the base of the column and condensates returned to the top of the column as reflux. This is the best way to cut down overall steam requirement to about 1 kg. per litre but the compressor system is expensive and electric power requirement is large. The conditions of electric power supply may be favourable in certain factories for a detailed study of MVC System for alcohol distillation. The use of steam ejector for vapour compression and reuse is already pr in some factories in India.

Another interesting method has been patented in and is based on ultrasonic vibration in the fermente auxiliary tank whereby voids are created. The void ar be connected to a suction pump when it is claimed tha strength alcohol can be tapped off leading to a reduc steam for final product recovery. Details are only on atory scale but the idea is worth trials to assess potent commercial use.

Another interesting development is of the use of drie powder as an absorbent for water in the dehydration o vol. alcohol to the 99.5% + Grade required for fuel b The absorption and dehydration of corn powder is s need less energy than the azeotropic dehydration met But by far the lowest energy needs for dehydration i "double effect" system where rectifier is run under about atm pressure when the boiling point is raised sufficient heat transfer to the alcohol boiling at the base of the dration column.

Another aspect which needs to be studied for a co interested in alcohol-based chemicals is the possibility of gration of alcohol distillation with the chemical conver For example the feed to the acetaldehyde reactor need necessarily be of 95 per cent and there is technically no for a condensation and reevaporation of the feed to the r tor. Links between the rectifier and the aldehyde reacto possible. It was also reported that ethylene from ethanol be operated even at lower concentration levels and in i grated operations. One could visualise 60 to 70 per cent a hol vapours being directly fed to the ethylene reactor preheating.

I have tried to elaborate on India's alcohol production need for improvements and innovations on our own not in efficiently converting molasses to alcohol but also t in terms of integrating the alcohol distillation with chem conversion so as to strengthen our position and be a t setter in this area. There are various problems arising ou the excise policies that have been pursued on this very i cately controlled industry but these could be relaxed in interests of efficiency and energy savings.

Refinery investment planning*

J.C. HOLDSWORTH
Foster Wheeler Energy Limited

troduction

As with other industrial operations of any complexity, finery operations require forward planning to ensure that e right products are made at the right time, at the right place d at the right cost. Petroleum refining and petrochemical oduction is a highly integrated processing system. It is also pital intensive in equipment, individually designed for spefic functions and not easily adapted for other uses. In an tegrated oil company, or in some instances national ecoomies, refining operations must also be planned in conjuncon with crude oil production and transportation and with e distribution and marketing of products. All these aspects sult in the need to use a three tier rolling planning proedure which depends on the planning time horizon involved; amely long term, medium term and short term planning.

The objective of this paper is to describe the techniques nd methodology exployed by Foster Wheeler when involved n a company's or national government's long term planning ctivity. This activity is typically concerned with the prelicted situation one to five years, or even more, ahead. It is used to identify decisions which are needed regarding such matters as investment in major new processing plants.

It involves consideration of long range of such factors as the demand for new and existing products and their prices, the availability of different crudes and their costs, the possible activities of competitors, fuel substitution and national economic trends. Since there can be considerable uncertainty associated with such aspects, these uncertainties also have to be taken into account.

The refinery investment planning process therefore involves:

1. taking a view of the future in relation to the anticipated markets of feedstocks and products and their relative prices.
2. looking at and developing the best way of satisfying the perceived market from a technical and economic standpoint to identify possible courses of action.
3. comparing the alternative courses of action, selecting the preferred scheme and ensuring that it is adequately robust to changes in various input parameters.
4. implementing the preferred scheme.

Techniques used for refinery investment planning

One of the most useful tools at the disposal of the refinery investment planner is linear programming. Linear programming (LP) is a mathematical approach to the solution of an optimisation problem in which the particular problem can be expressed in a series of linear equations or inequalities. The optimisation is made within user imposed constraints on a particular objective function. The objective function is typically profit or capital investment which is maximised or minimised respectively to produce the desired optimal solution.

For performing their refinery investment planning studies, Foster Wheeler has developed a custom build program utilising linear programming techniques to optimise refinery or petrochemical complexes against input criteria and constraints. The program was developed to eliminate most of the laborious hand calculations formerly required to accomplish an in-depth refinery economic study. Utilising the program enables the most economic refining or processing scheme to be sought amongst the infinite number of alternatives within the constraints that have been set. The program is capable of handling extremely complex processing schemes limited only by the users' ability to devise and accurately describe all the significant alternatives and their ability to interpret the results. A feature of the program is that it transposes and manipulates the raw optimised data into a management report that is understandable and completely describes the optimal scheme.

Other computer models are employed in the planning process. Using usually a spreadsheet system, economic and financial models are created which are tailored to the environment in which the project is being considered.

The planning process

To be viable, a refinery must convert all the crude oil into products of the highest total value. Since crude oils from different sources vary in composition and quality, the market demand pattern for products rarely matches the pattern in which they occur in their natural state. Therefore, an important function of refining is to rearrange the natural pattern of products into what is actually required.

Another important characteristic of a refinery is its processing flexibility. This is the extent to which it can accommodate changes in the demand patterns or quality specifications of its variety of products or changes in the type of crude oil processed. It is not possible for a refinery to be completely flexible. Therefore, an important part of the planning process is to consider what flexibility can be accommodated without escalating the project cost so as to affect

* Paper presented at the Oil, Gas and Petrochemicals Seminar held in New Delhi in January 1989.

the viability of the project. It is thus necessary to be satisfied that the size and configuration of the project is optimised, and most importantly, that it is adequately robust to changes in the input parameters.

In embarking on a study of a new project is is necessary to first establish the overall **external criteria.** In summary these are:

* product demand
* product specifications
* feedstock availability
* crude cost and product prices
* existing facilities
* investment limits

Looking at these in more detail

Product demand

The first information that is required is the predicted product demands for all the petroleum products. These can be either a maximum capacity demand representing the highest expectation of the product market, a minimum demand representing long term contracts or even a fixed demand where there is no long term flexibility in the market for a particular product. Predicting future markets for a refinery which may not be onstream for five years and which may need to repay its loans over a further 10 years is shrouded with uncertainty. When Foster Wheeler is requested as part of the study to take a view of future markets, a scenario approach is adopted.

Scenarios attempt to define a series of consequences arising from basic assumptions about what the future could be like. Taking this approach provides the opportunity to see if the proposed scheme could be viable under different sets of internally consistent circumstances. It it looks profitable under only one scenario but seems vulnerable on others then there is an apparent lack of robustness in the scheme. If, however, a project continues to display a profit under different assumptions, it points to a level of robustness which gives increased confidence in the scheme.

Product specifications

The range of specifications that the products have to meet are required. An important point to establish is whether there is any legislation being considered that might relax or tighten any of the specifications. The study may in fact be to consider the implications of such a change.

Feedstock availability

The feedstocks that are likely to be processed by the refinery are identified. Restrictions on their availability are also established. If the new investment is being conceived around existing facilities it is important to establish what crudes the existing facilities are capable of processing.

Crude cost and product prices

Having established the crudes to be considered, t
ducts to be produced and their specification, it is ne
to establish both the likely cost of crude and prices
ducts. Again, predicting such future values is shroud
uncertainty. To obtain such views of the future,
Wheeler either employs outside consultants or uses i
in-house economists. When developed in-house th
approach is adopted for the cost and price data as for
sing future market demand. The scenarios develope
ject different trends in crude prices as their starting po
draw conclusions about the behaviour of product prices
the particular set of circumstances which those crude
would bring about. As previously noted, this approac
vides the opportunity to see if the proposed scheme
be viable when considering differing views of the futu
has already been mentioned, it is important that any sc
proposed is robust to changes in the input parameter

Existing facilities

If the new investment is to be built around existing
lities — either process units or utility supply, these are
tified.

Investment limits

Finally, any externally imposed limits on the maxi
or minimum, size of the project either physical or finan
are established. Other factors are also obtained which im
on the project viability, such as expected project life, requ
rates of return etc.

Having obtained the set of external criteria to which
study is subject, it is then possible to develop the opti
internal criteria and the definition of the linear progr
ming model.

In the formulation of a refinery model, the maximum f
ibility which is possible in the potential operation is inclu
so that when it is optimised the most realistic and 'best' s
tion can be sought. This requires selecting the range of
operations to be considered for selection and how the
together. If the potential future investment is to be built arc
existing facilities and these facilities affect the solution
it is appropriate to build them into the model together
the potential options.

In order to ensure that all possible processing options
considered, the initial set of unit operations available for se
tion are made larger rather than smaller. This is done beca
it is relatively much easier to suppress a less likely unit o
ration from coming into a solution than it is to add re
spectively if the study develops in an unexpected direct
To aid the understanding of the model, a 'Stream Decis
Diagram' is produced. This shows how the facilities, po

and existing, tie together and how the various streams be routed to products.

aving decided on the range of unit operations, for exam- hydrocracking, fluid catalytic cracking, etc., the poten- processing objectives are established and a decision is e on the crude types, cut points etc. to be incorporated the model. The data associated with these crude types, points, and operating modes are then developed for each operation.

his includes such information as:
ield data
roduct property data
tility data
perating costs
nvestment data

Having established the model of the refinery and tested o ensure the logic is working correctly, it is then ready use. Running the model against a set of external criteria ll provide an optimal solution to the problem. In arriving his solution, the linear programming model assesses the ative attractiveness of one configuration, capacity and/or erating mode over another.

Whilst the first set of solutions produced represent the most ofitable configuration, they may not be the most techni- ly realistic. It is important to recognise that the linear pro- mming model is used as a tool to find the solution. It is, fact, necessary to perform several model runs to establish most viable and technically realistic scheme.

These runs may include:
eliminating unrealistic unit operations e.g. by removing from the solution units that have been selected with an impracticably small capacity
nvestigating the impact of different external criteria e.g. product demands, specifications of price sets
forcing the model to investigate different alternatives e.g. by eliminating particular unit operations

It is from this multiplicity of runs that the preferred scheme d possible alternatives are developed. An important advant- e of using linear programming (LP) and related techni- es is that as well as producing a specific configuration rresponding to the input data, it also provides information nich indicates the effects of changes in the solution, both terms of economics and interaction with other products. normal LP solution as well as giving the optimal values all the variables also provides information in the form of adow prices which indicate the sensitivity of the objective nction to changes in the solution. These are useful in ana- sing for possible improvements to the economics of the refinery via removal or alteration of key constraints. For example, it will indicate the relative value of relaxing a particular product specification or identify products which could profitably be sold in larger quantities. This information is particularly useful for deciding which other runs might be appropriate.

Having arrived at the preferred scheme and possible alternatives using the LP refinery model, the next step is to test their absolute viability as an investment proposition. Detailed economic analysis is performed on the proposed scheme(s). At this stage, the investment costs and operating costs of the proposed scheme can be re-examined in more detail for the precise scheme.

The detailed economic analysis is used to confirm the actual economic viability of the preferred scheme and to test its sensitivity and robustness to changes in various economic criteria. Criteria considered are as follows:
* different crude and product price scenarios
* changes in specific prices
* changes to the investment cost
* project delays
* changes in operating costs
* loan repayment period, if applicable

It also reviews the viability and robustness of the alternative schemes thus ensuring the best practical scheme has in fact been selected.

If the results of such changes conclude that the preferred scheme is robust from an economic standpoint, the scheme is then further checked with the LP refinery model to test its technical robustness and sensitivity to changes in feedstock, demand levels, product specifications etc. Parametric analysis, available within the linear programming system, is often used at this point.

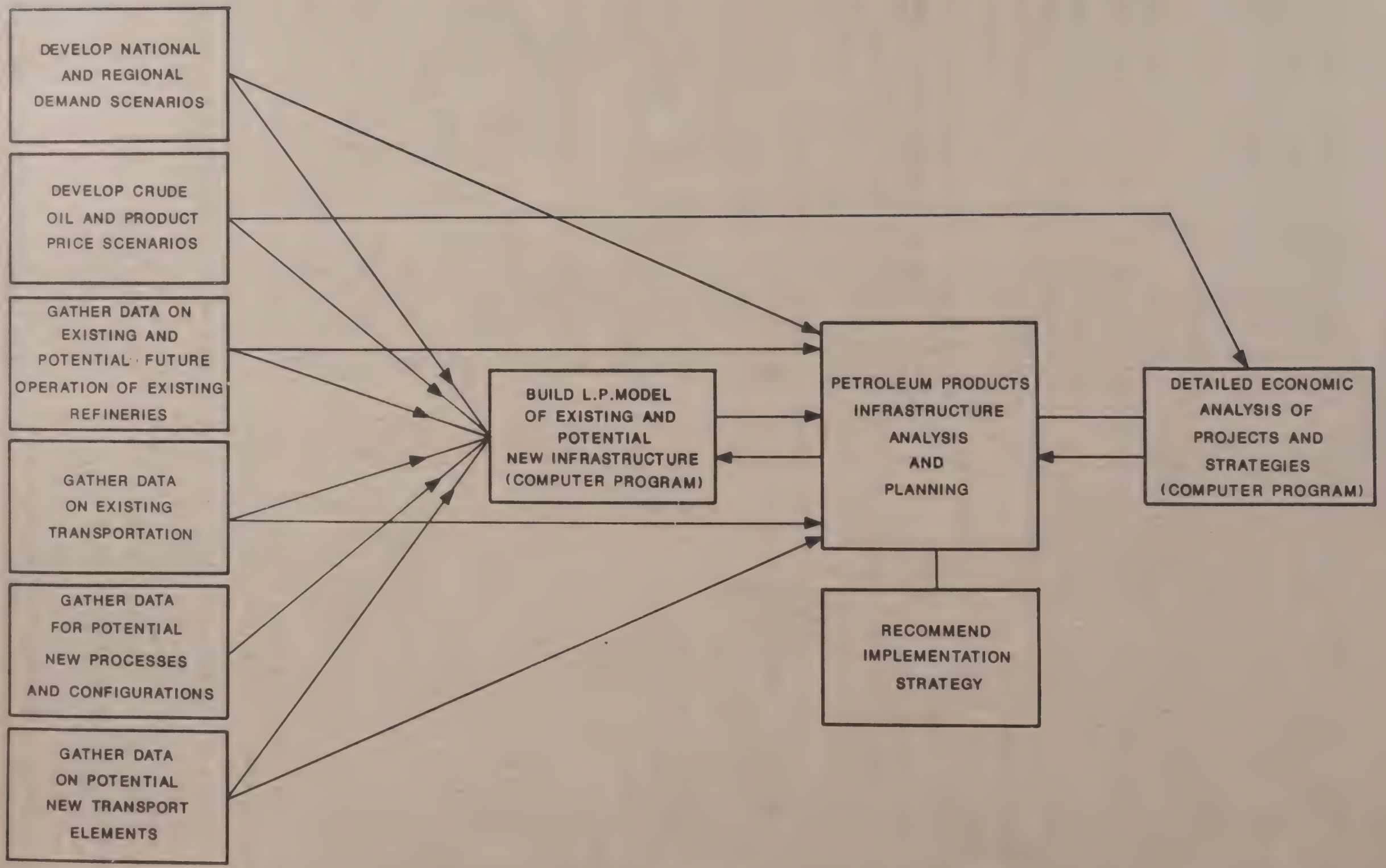
This analysis may well result in further changes to the proposed scheme by introducing additional flexibility. If this transpires, the scheme is again subject to a further detailed economic analysis to ensure that it is still economically viable and robust and the changes to the scheme are cost effective.

At this stage in the planning process, one should have a scheme which is both technically realistic and economically viable. The next step is to test its financial viability. Here aspects such as:
* depreciation policy
* taxation policy
* inflation/escalation

are considered.

If the proposed scheme is still viable at this stage and it

FIG.1. INTERRELATIONSHIP OF INFRASTRUCTURE ANALYSIS



likely that the necessary funds can be raised to sup-
t, the project can then proceed into the next phase of
velopment. This could be the development of the pro-
lesign leading to the preparation of a definitive cost esti-

wever, other factors may be involved before the invest-
decision is confirmed. These may be political factors
ring such aspects as:
ategic importance of the project
pact on national economy
mpetition from similar facilities in neighbouring countries
e factors are amongst the most difficult to consider
use they are usually subjective.

nless the project is being considered by a sponsoring body
can fund it on a cash basis, there are usually loans to
btained and in turn, a security structure must be deve-
d. This may include:
edstock supply agreements
roduct offtake agreements
ortgages

Even when the investment decision is approved, the plan-
g process will continue. As the project proceeds through
various stages, the viability of the proposed scheme will
tinue to be monitored against any changes in the input
ameters. It is not unknown for project to be shelved or
cess configurations to change following initial approval.

plications

The techniques and methodology identified are suitable for
forming refinery investment planning studies covering the
bility of small revamps or inclusion of new unit opera-
ns in existing facilities through to assessing the viability
major expansions or complete grass root refineries and pet-
hemical complexes. They can also be applied to perform-
petroleum product infrastructure studies for large
mpanies and national governments. This entails planning
ure refinery operation in conjunction with crude produc-
n and transportation and with the distribution and mar-
ting of products.

In a recent application the viability of increasing a country's refining capacity to meet the country's internal projected demand was assessed, together with assessing the country's transportation system for moving feedstock and products against the future requirements.

The elements of the study included:

* Development of national and regional demand
* Development of crude oil and product price scenarios
* Gathering data on existing and potential future operation of the existing refineries
* Gathering data on the existing transportation system, i.e. roads, rail and ports
* Obtaining data on potential new transportation elements
* Obtaining data for potential new processes and configurations
* Building a linear programming model to represent the existing and potential new infrastructure
* Performing infrastructure analysis and planning
* Performing detailed economic analysis of projects and strategies

From these elements an implementation strategy was proposed. Fig 1 shows the inter-relationship of the elements of the study which led to the recommended strategy.

Conclusion

New refinery investment involves large sums of money. The planning process therefore deserves very close and detailed attention. It is thus important to be satisfied that such an investment:

1. is optimised though it may not necessarily be the theoretical optimum
2. can accommodate changes in demand patterns; quality specifications of its variety of products; or changes in the type of crude oil processed
3. is technically realistic and economically viable and is robust to changes in various input parameters

Using the techniques and adopting the methodology outlined in this paper ensures that the above objectives are satisfied.

News from Abroad

BP TO GO AHEAD ON ETHYLENE PLANT

BP Chemical (London) has decided to go ahead on its decision for a huge addition to its Grangemouth, U.K. ethylene plant as a part of an integrated 85 million dollar oil and gas processing plan.

About 386 million dollar will be spent on raising ethylene capacity at the Grangemouth facility, boosting total output from 270,000 tonnes/year to 600,000 tonnes/year by mid 1992. Liquefied petroleum gas feedstock will be supplied from the North Sea via an enlarged processing plant over the fence at Grangemouth.

The ethylene is intended for internal consumption. The company is scheduled to bring on stream a 125,000 tonnes/year linear low density polyethylene unit at Grangemouth, early next year. A 96,000 tonnes/year polyethylene plant at the site is being shut down.

The company is also adding 100,000 tonnes/year to the high density polyethylene plant at Grangemouth, which will take capacity to 250,000 tonnes/year by 1990. Polyethylene capacity at Grangemouth will reach 375,000 tonnes/year by the end of 1990 BP Chemicals has also debottlenecked its low density polyethylene plant on ICI's Wilton, UK to 100,000 tonnes/year.

Although the BP unit is identical to that of the No.6 Phillips Petroleum unit at Pasadena (Texas) that blew up October 1988, the company has done extra safety check, to ensure safety, according to a company spokesman.

US TO TAX CFC MANUFACTURERS

The US congress has recently cleaned a deficit reduction bill that imposes a 100% tax on chlorofluorocarbons and other chemicals. The tax approved over the objections of the chemical industry levies a charge of $1.37/lb in 1990 and 1991 on CFC-11, -12, -113, -114 and -115 and on Halon-1201, 1301 and 2402.

In 1992 the tax jumps to $ 1.67/lb and in 1993 and 1994 to $ 2.65/lb. By the end of the next decade the tax will reach $ 4.90/lb. The tax is expected to raise $489 million in 1990 $ 691 million in 1991, $ 784 million in 1992, $ 1.05 billion in 1993 and $ 1.3 billion in 1994.

The measure exempts feedstock chemicals and recycled CFCs. Substances used in making foam insulation are also example from the 1990 tax and will be taxed at a lower rate in recognition of their energy-efficiency value. The CFC tax, when levied, is likely to hit the distribution chain, chemical manufacturers fear.

The Congress also approved a 5 ct/barrel tax on oil to create a $ 1 billion fund to help clean up oil spill; spurred by the rupture of the Exxon Valder tanker in Alaska in November. The plan also levies a 3-ct/barrel on oil produced on the outer continental shells. That fee will be collected until the fund reaches $ 200 million.

The deficit reduction bill contains important tax provisions. The congress continues to provide the basic incentive for R&D the tax system has traditionally provided and recognises that capital intensive industries are subject to inequitable taxation from the alternative minimum tax.

The bill provides for allocation of 64% of US incurred research expenses in US rather than foreign income for a nine-month period. Congressional conferees rejected a proposal that would have denied industry the ability to write off expenses for foreign R & D over several years.

NOW HCFC-22 FEELS THE SURE

Proposals could dim for dev
key chlorofluorocarbon (CFC)
tutes if a proposed amendmen
Montreal Protocol is adopted.
proposal sets a phaseout sched
hydrochlorofluorocarbons (HC

The measure has move
(London) to reexamine its pl
expand production of HCFC-2
feared differing actions by ind
nations instead of a concerted eff
destabilise international activity

According to an Environment
tion Agency (EPM) spokesman,
proposal will reduce stratosphere
ine levels to two parts per billi
2075 and allow time for produce
users to benefit from inventing in
alternatives.

A two-stage is approach to b
lowed phasing out HCFCs from
proudct between the years 202
2040, and a phaseout from ex
equipment between 2035 and 20

But according to a Du Pont/sp
man the time frame proposed by th
is to what to allow a full swit
hydrochlorofluorocarbons by dev
ing nations. It would be better, fo
first phase to start in 2030, to give
nations more time.

Major investment decisions by
ducers and users of CFC alterna
hinge on firm availabilities of
compounds, producers feel. Cap
growth, volume or ozone depl
potential will delay or prohibit in
ment and the transition away
CFCs" it is feared.

Because of the threat of near
regulation of hydrochlorofluorocarb
less than 5% of the capacity neede
switch from CFCS is under const
tion, according to a Du Pont spokes

Chemical News from Abroad

ATIONALISES PAINTS IN ADA

's Canadian paints operation, , is to close down two of its man- ring plants near Toronto with the f 90 jobs. The move is part of rationalisation in the paints t, where it is the world leader.

is decision comes as a result of apacity in the stagnant North ican decorative and industrial markets," says Graham Llyod, of the company's operations. "We ommitted to having a strong paint facturing base in Canada, but in to remain competitive, some cturing of our business is neces-

oduction at the Wallace Avenue will halt at the end of April 1990 he activities will be transferred to Glidden facilities in the US. The alea plant will be closed at the end ptember 1990 and most of its pro- on will be moved to a new plant oucherville, Quebec.

eanwhile, ICI's Canadian subsid- C-I-L, has completed the sale of netics International to the UK's Brown. The divestment is part of tructuring plan announced by the pany in 1988. Other businesses div- l include C-I-L's plastics, sulphur ucts and oilfield divisions. The e of the transaction was not dis- d.

LENIC OFFER AROUSES ERES T

ypriot concern, Hellenic Chemical stries Ltd., says it has been oached by Swiss, Italian and lle Eastern companies, that are rested in leasing its fertilizer com- at Vassiliko in Southern Cyprus.

he complex, which manufactures over 65,000 ton/year of suphuric and phosphoric acids and potassium fertilizers, had a turnover of around £20m ($31.4m), with about three quarters of production being exported mainly to the European market.

The complex was previously leased to Cypriot company CCF Industries for £1.5m, but financial problems have forced the company to withdraw.

FRENCH MOVE FOR NH

Norsk Hydro's French affiliate, Norsk Hydro Azote, has taken a 40 per cent stake in Sud Fertilisants, a subsidiary of French fertilizer company Cedest. Under the agreement Norsk Hydro has given Cedest its L'Etang de Thau fertilizer unit located near Sete, South East France.

Both partners in the joint venture have increased their corporate capital by some FF62.5m ($10m) thus providing Sud Fertilisants with FF110m of equity. The joint venture will produce 500,000 ton/year of fertilizers, making it the leading producer in the South East and South West regions of France.

PETRORIO LAUNCH CLEARS THE WAY FOR ITAGUAI

Petrorio, the company created to set up the proposed Itaguai Petrochemicals complex in Rio de Janeiro state, was officially inaugurated recently. It will serve as a basic services company for the complex, responsible for installing and operating the central raw materials unit, as well as providing thermoelectric power, supplying water and treating and disposing of liquid and solid effluent.

Companies participating in the Itaguai complex are obliged to subscribe to Petrorio's share capital, which consists of an initial $14m, plus a proposed capital increase of $140m, which is likely to take place over the next few months. Petroquisa, the petrochemicals arm of the state oil corporation Petrobras, will take a 35 per cent stake, with 30 associated companies taking 40 per cent and 12 second-generation product markers the remaining 25 per cent.

Petroquisa's vice-president and president of PetroRio's executive, Jose Juca Bezerra Neto, expects work on the infrastructure to begin in July 1990. The deadline for project proposals for Itaguai expired on 6 October. Juca expects decisions on the choice of projects to be finalized by mid-1991, and PetroRio's central raw materials unit and its dependent secondary plants to be operational by 1996.

Projects which are independent of the central unit, such as phenol, acetone and acrylic acid production units, are expected to be on-stream by 1993.

Of the projects already submitted, Empresa Petroquimica Carioca (EPC) released details of a $65m investment plan to produce 168,000 ton/year of liquid caustic soda, 90,000 ton/year of hydrochloric acid, 36,000 ton/year of sodium hypochlorite, 47,000 cubic metres/year of hydrogen, 146,000 ton/year of dichlorethane, 181,000 ton/year of monovinylchloride and 180,000 ton/year of polyvinylchloride. The project will also include capacity for 200,000 ton/year of high and low density polyethylene and polyethylene copolymers, which will be variable according to domestic demand and export opportunities.

EPC intends to finance 50 per cent of costs internally, with the remaining 50 per cent coming largely from the National Development Bank, BNDES.

EPC consists of a joint venture between: Norclor, which holds 25 per cent, Oxy with 22.5 per cent; Icatu Empreendimontos, also with 22.5 per cent; and Occidental Quimica do Brazil, which holds 25 per cent.

NL SETTLES OB BID FOR GEORGIA

NL Industries, controlled by Texas investor Harold Simmons, has made a $50/share bid for Georgia Gulf, the US manufacturer of commodity chemicals and polymers. The offer values Georgia at around $1.2bn.

NL, which already holds a 9.9 per cent stake in Georgia, originally approached the company with a proposal for a merger, takeover or recapitalization in late August 1988. It suggested a transaction where shareholders would receive $55/share.

NL says it reduced its offer to $50/share because the current unsettled state of the junk bond market would make financing more difficult to procure and because of poorer results forecast for Georgia.

Georgia Gulf has reviewed the proposal from NL, as well as "indications of interest from other third parties relating to various forms of business combination."

However, it says no alternatives have been eliminated from consideration and gives no assurance that any transaction will take place. It is holding discussions with interested parties.

Meanwhile, Georgia has agreed to form a joint venture with Atochem to market its special purpose moulding vinyl compounds in Europle, Africa and the Middle East.

The venture, 55 per cent owned by Atochem and 45 per cent by Georgia, wil provide for Atochem's sales network to market the products and for their manufacture in Atochem's existing facilities from early 1990.

SOLVAY DIVESTS US GEN FIRM

Belgium's Solvay has sold o US pharmaceuticals operation pharma Inc, to Molecuon f $22m. Molecuon is the US a of the Australian drugs compla Faulding. The move is in line w vay's strategy of focusing on ceuticals specialities. Kalipharm in New Jersey, produces generi maceuticals. Faulding now owns cent of Moleculon's voting sto has an agreement to purchase a tional 19 per cent.

This, together with its hold preferred convertible stock, gives ing the option of increasing its s 70 per cent. Duphar Medical D a division of Kali-Duphar Inc, a Solvay subsidiary, is not part deal.

Chemical markets abroad

F PETROCHEMICAL PLANS RM EUROPEAN PRODUC-

negotiations for a bilateral free area between the EC and the Gulf peration Council (GCC) loom r, European petrochemical produc- re voicing concern over the future ne industry. A draft negotiating date for the community is expected e approved by the council, shortly.

efic feels the proposal is being ed in, without a due voicing of the stry's concerns. The length of time n by the commission over initiating draft, gives an indication of the e's controversial nature.

y simply considering the aggregate ume of Gulf petrochemicals as a portion of the region's exports to the , one misses the changing composi- n of GCC exports that will result m both the trade agreement in ques- n and the current downstream estment in Gulf petrochemical capa- '.

Kuwait, for example, is planning to ng on-stream over 500,000 ton/year polypropylene, ethylene glycol and rene, while Bahrain is planning a acity hike of up to 750,000 ton/year. rylonitrile and aromatics are also said be on agenda.

In 1988, methanol imports from the lf to the EC stood at 33 per cent of total. A spokesman for Cefic esti- tes that this share could rise to ween 50-60 per cent with the imple- ntation of the proposed free trade a. Similarly lldPE, having recently ctuated between 30 and 50 per cent, y see the GCC's share increase to -80 per cent. Some of the more sen- ive imports from the GCC are gen- ally felt to be susceptible to a 20-30 r cent rise in their share of EC ports. The most dramatic scenario for the West European market is one where prices may come under such pressure that while other deep sea suppliers are forced to withdraw, being no longer able to cover variable costs, the GCC producers would meanwhile continue exporting due to their lower feedstock costs.

The commission believes a transitional phase will allow European industry to undertake the restructuring necessary to face the challenge. It also sees a market in the Gulf for European hi-tech products. While Cefic recognizes the need for technical innovation if the industry is to stay competitive, it maintains this process is already under way.

In Cefic's view, the stimulus coming from integration with the Gulf will be unnecessary, and would in fact jeopardize downstream industries dependent upon European petrochemical production.

The feeling among producers is that they are being sacrificed to an unfair bilaterial agreement being dictated by mainly political considerations.

THERMOPLASTICS DEMAND RISES

European consumption of thermoplastics looks set to reach 13.6m ton/year in 1988-1989. The largest user will be West Germany with demand of some 4.7m ton/year, according to consultant Phillip Townsend Associates. France follows with consumption of 3.4m ton/year and then the UK with 3m ton/year.

Polypropylene is the most used feedstock by European plastic processors, being preferred by 2,428 convertors, this is followed by phthalic anhydride, the feedstock in 2,318 sites.

In a detailed look at France the consultant claims PVC is the most commonly used polymer, with 805,000 ton/year being processed in the time period.

Customers used a total of 669,000 ton/ year of ldPE in 1988-89, followed by polypropylene at 425,000 ton/year.

The most popular process in France is injection moulding with 1,103 convertors preferring this technology.

Lagging way behind is film extrusion utilized in some 152 French polymer units.

The three largest convertors in France are DSM at Lyon, Atochem at Saint Chamont and Autobar Federation based in Firminy.

EEC petrochemical imports

	From GCC (ton)		Total (ton)	
	1988	Q1 1989	1988	Q1 1989
Styrene	30,000	10,000	150,000	40,000
Methanol	600,000	200,000	1.8m	500,000
Ethylene glycol	70,000	13,000	180,000	30,000
Diethylene glycol	20,000	4,000	40,000	6,000
Melamine	23,000	2,000	33,000	8,000
lldPE	140,000	14,000	280,000	52,000
hdPE	80,000	8,000	280,000	60,000

SODA ASH PRODUCERS INCREASE OUTPUT

European and US soda ash producers were able to operate close to capacity rates last year as demand rose and caustic soda markets tightened. According to UK consultant Roskill Information Services world soda ash production rose by 8 per cent in two years from 1986.

However, although the industry appears buoyant it may be that the recent growth disguises what is actually a downward turn.

According to Roskill, consumption of soda ash in world market economies was virtually the same in 1987 as it was in 1974, whereas Western European consumption fell by 1.4m ton to 5.26m ton.

Over the same period consumption in the US dropped by 700,000 ton to hover at around 7m ton. The overall level of world consumption was maintained by increased rates of consumption in other areas, notably in Asia where demand rose by 50 per cent to 3.3m ton.

65 per cent of Western Europe's soda ash production is intended for the glass industry. Roskill claims the decline in demand for soda ash by Western European consumers can be attributed to the increased recycling of glass and the substitutions of metal cans and plastics for container glass products.

Roskill bases its argument on UN, US and EEC statistics which indicate that while the quantity of materials to be packaged has grown significantly since the mid-1970's, production of container glass using raw materials has remained more or less stable.

Roskill says that in 1986 Western Europe's total production of container glass amounted to around 12m ton. Of this 11.5m ton were used within Europe and 29 per cent of that involved products which had included recycled glass in their manufacture.

Switzerland, the Netherlands, Belgium and West Germany are among the European countries which use the largest amounts of recycled glass within their glass manufacturing industries.

Before container glass can be recycled it has to be sorted by colour. West Germany's glass industry has indicated that its consumption of cullet could increase from 1m in 1986 to 1.75m. ton within a few years, provided that the quality of cullet was improved through more specific colour sorting.

According to Roskill if this level of recycling were to extend throughout Western Europe, the quantity of container glass produced from raw materials would fall by around 3.5m ton, resulting in a cumulative reduction in the consumption of soda ash of 700,000 ton over a period of five to ten years.

However, Roskill anticipates a brigher future for the chemical end-uses of soda ash.

NEW US PLANT SHUTDOWNS HERALD BENZENE PRICE HIKE

Benzene prices are showing no signs of losing their volatility, jumping $75/ton in less than two weeks. Again, the US is the main driving force behind the latest price convulsion. The continued sequence of unscheduled outages is now coupled with producers suffering difficulties in restarting HDA units after maintenance turn arounds.

Cain Chemical's 330,000 ton/year plant was due for re-commissioning in the past few weeks. However, though the 200,000 ton/year reformer unit started without a hitch, the 130,000 ton/year HDA plant is causing problems. The first attempt to restart the HDA unit did not prove successful. Cain claims any faults have n ironed out and expect to be p "on spec" material in the v future.

Another of the major US pr Dow Chemical, has recently co a turnaround at the 330,000 Plaquemine HDA unit. Initial bring the unit on-stream failed thought that some difficulties ha in the heat exchange unit, but i believed that a leakage, due to d bolts, is considered the most fault. Both Cain and Dow s expect to have another go at re their HDA units in the very near

Over the last 10 days, during time the seriousness of the Plaq outage was unknown, Dow has the market as a major buyer o sides of the Atlantic. The majo est from Dow helped push US ers up from $1.35 to 1.55/gallo rising. In Europe the Dow purc and those by traders, helped prices from $395 to 445/ton fob The last major US effect on be concerns the shutdown of C Chemicals' 215,000 ton/year plant. The plant had been operat way below its full capacity due to blockage, which stopped the fre of material. It has now been deci is better to put the plant down and out the unit with a powerful so returning the plant to full capac

It is estimated that the unit down for a total of just unde weeks. This outage confirms the i product shortages in the US. Ba Europe, benzene players are viewi continued opportunities presented US. Traders especially contin source material to shift to the US means of filling the gap left by ou Inter-trade deals are one of the mai tors in the rising benzene market. the market changed direction, between traders rose rapidly $375/ton to stand at $445/ton fob terdam.

Two Saudi Arabian tenders totalling ,000 ton of benzene, have helped hten supplies in Europe and the Med. e 10,000 ton and 15,000 ton tenders e believed to have been met by a wiss-based trader and the trading arm f a major European producer. All the aterial going to Saudi Arabia is elieved to have been sourced, thus dding to the overall tightness in urope.

The last benzene price disruption ame recently, with buying from Lyonel, which at that time was suffering rom technical difficulties. This was xacerbated, on the price front, by outages at Arochem and Petro-Canada. These disruptions are believed to have virtually disappeared, with most repairs complete. After prices had settled down to $1.28/gallon in the US Gulf, the three outages propelled prices from $1.28/gallon to 1.38/gallon, as the latest factors came into play.

ETHYLENE CONTRACTS

Ethylene monthly contracts have been settled at DM900-945/ton by Shell, down from DM975-1015/ton in October. Dow has settled at DM900-915/ton, down from DM975/ton in October 1989. The November numbers, somewhat lower than the quarterly range which appears to be emerging, are seen by Dow as reflecting the downward trend that prevailed earlier on in the quarter.

In the propylene market Shell numbers for November are DM725-752/ton, down from DM779-796/ton in October 1989, when the lower end of the range was representative of only a minority of settlements. Dow has concluded at DM700/ton for November, and expects the price to hold despite the likelihood of continuing availability of exotic material.

JO ORDERS NEW SHIPS

JO Tankers has ordered four new sophisticated 38,000 dwt parcel chemical carriers, at a cost of some Nkr1.8bn ($260m). The vessels will be built at the KMV shipyard in Kristiansand, in Norway. It is expected the first vessel will be delivered by December 1991.

The new tankers are expected to utilize the latest technology, with stainless steel centres and 41 segregated cargo tanks. Jo Tankers says this latest move is part of its fleet renewal process. The current freight rates do not appear to justify new building.

This latest move continues Jo Tankers' recent trend of ordering new tankers. Last year the company ordered two 12,300dwt tankers, to be built at the Viareggio shipyard by Alta Italia. These vessels are expected to be delivered by early 1991.

STYRENE PRICE SHIFTS REMAIN UNCLEAR

After being relatively stable in October styrene has begun to attract interest in the past weeks. The position of European product remains unclear due to a number of variables. Traders claim that lower numbers of $580/ton fob NWE have been recorded in deals within Europe. However, producers claim these numbers are only available for export product.

According to sellers the range of $605-610/ton is still relevant. One definite deal of $580/ton fob NWE has been confirmed, but this is thought to be a one off deal put together by a French producer. The parcel is being targeted at the Far East, which has lower inventories.

Supporting the argument of lower European numbers, due to surplus product in the market, is the series of completed maintenance turnarounds. Montedipe recently increased output at its Montova plant by some 150,000 ton/year, bringing its nameplate capacity to 500,000 ton/year. Although the plant is back up, it is not thought to be working at full capacity, due to the availability of ethyl benzene and the time it takes to commission the plant fully.

Orkem has also completed a catalyst change at its 210,000 ton/year Carling plant. Atochem's 350,000 ton/year Gonfreville unit is now working flat out and adding to the perception of a longer market. Some observers feel European producers may be discreetly selling into the market, hence the lower numbers, but this is yet to be confirmed.

European producers admit the maintenance season is now complete, so in theory availability should have increased. However, the latest turnarounds on France and Italy have yet to see the plants reach nameplate capacity, so undermining the long market scenario. The current upward movement in benzene prices is cited as another reason why styrene prices should hold up.

Changes in the Far Eastern market are having a noticeable effect on global styrene prices. From the low point of $560/ton cif Far East in the summer, prices have firmed to the current level of $640-650/ton cif Far East.

One factor causing the stronger numbers has been the extended turnarounds suffered by Japanese producers. Mitsubishi Petrochemicals' 260,000 ton/year plant and Idemitsu's 100,000 ton/year plant, where both due in October. Both re-commissionings have been delayed, with no new date being given.

It is tacitly recognized by some producers that a tiered price system exists. Product due for export to the Far East is being sold at around $580/ton fob NWE, which works out at around $640/ton cif NWE.

It is recognized that if European sellers wish to remain competitive in the Far East, they have to offer reasonable numbers.

Environment

WEST ASSISTS EAST WITH POLLUTION PROGRAMME

Western Europe is investing in pollution control in Eastern Europe in order to protect the common environment. Sweden has announced a $45m research, training and technology transfer programme for Poland intended to rescue the Baltic Sea from the effects of an ecological catastrophe. The programme will promote collaboration between many industries and scientific and technological research establishments in the two neighbouring countries.

Many similar technical assistance programmes linking Eastern and Western Europe are likely to follow, fostering collaboration in scientific and technological research and training.

"Poland's enormous environmental problems are badly hitting the local population," explains Lena Hjelm-Wallen, the Swedish minister for international development cooperation, "but they are also affecting us through transboundary pollution."

Similar sentiments were expressed by West Germany earlier last year when it announced a project to help East Germany to tame its underfunded chemical industries from polluting Europe's seas.

Such environmental assistance is in the direct interest of the West, comments the Washington-based Worldwatch Institute in an important recent discussion paper, "since it is easier to stem pollution at source than to clean it up when it blows over the border." The widening programme involves collaboration in the chemical industry as well as reserch, training and investment. It may well affect health standards throughout continental Europe.

International cooperation for pollution control is to be promoted and coordinated in a big way by the EC's projected environment protection agency, expected to be established very soon.

Aggressive industrialization and rigid planning applied since the Second World War have made the Eastern block one of the world's most heavily polluted regions. The extent of the damage is just beginning to be officially admitted. The worst affected countries are Poland, East Germany and Czechoslovakia. A study issued by the Polish Academy of Sciences estimates the minimum losses due to environmental pollution at 10 per cent of the country's annual gross national product. The study describes about half of Poland's total water resources as unfit for even industrial use; and it acknowledges that " the balance of nature has collapsed in more than 10 per cent of the countryside."

Similarly devastating authoritative assessments are being published, sometimes still in the face of official disapproval, throughout the region. East Germany reckons that its industry emits about 5m. ton/year of sulphur dioxide into the atmosphere, more than any other country in Europe. The Czechoslovakian Academy of Sciences estimates the national cost of acid pollution at $1.5bn/year.

Sweden is particularly concerned with the effect of chemical pollution transported by the Vistula river into the Baltic. Once known as the queen of Poland's rivers, the Vistula collects the wastes of many industries as it sweeps across the country from the Carpathian mountains in the south to the sea in the north. The river accounts for two-thirds of the 132,000 ton/year of nitrogen entering the Baltic. It also deposits 5,000 ton of phosphorus and 3 ton each of highly toxic phenol and lead as well as unspecified quantities of mercury, cadmium, zinc and other heavy metals. The bay of Gdansk, the biggest city on Poland's Baltic coast, is saturate chemical wastes from the Vistu

Poland has launched an am programme to clean up the riv building some 188 large water cation plants for the treatment of m ipal sewage and industrial was well as 200 smaller plants for h toxic chemical wastes. Many dou government's ability to raise in the seeable future the $1bn needed fo project.

Sweden meanwhile has invite concerned industries, universities other specialist agencies and autho in both countries to suggest way improving collaboration in pollu control under the new three-year b eral programme. East and West many are also joined in a new three- chemical waste control programm reduce pollution of the Elbe river, which an estimated 27m ton/yea mercury is dumped, and the Ba Their research, training and technol transfer programme worth about $28 three-quarters of it funded by W Germany, provides for the erectio advanced coal burning facilities power stations and incinerators for disposal of chemical and pharmace cal wastes.

The US and the Netherlands are p viding some additional economic as tance to Eastern Europe for pollu control. Some multilateral aid is av able from the World Bank and United Nations Development P gramme.

The focus of East-West cooperat in the area is the UN Economic Co mission for Europe.

A collective approach to controll pollution throughout Europe will promoted by a new environment pro tion agency to be established by the under legislative proposals prepared the council of ministers for approval the European parliament.

News about new projects

AZILIAN FIRMS DETAIL PANSION PROPOSALS

Three companies in Brazil have eased details of proposed investment ojects at Rio's Itaguai complex and Triunfo. Ipiranga has disclosed plans r a $170m investment project at both mplexes, while Petroclor is proposing VCM/PVC project and a chloralkali ant at Triunfo, and Estireno do Nor-ste (EDN) is planning to compete for ethylbenzene/styrene monomer/PS roject at Itaguai.

At Itaguai, Polisul, jointly owned by piranga, Hoechst and Petroquisa, has esigned a $70m project for a 100,000 on/year hdPE plant based on Hoechst echnology. It is also planning a 105,000 on/year ethylene oxide plant, also cost-ng around $70m, using Hoechst tech-nology combined with Shell catalysts, aid Eduardo Gouveia Vieira, manager of Ipiranga's petrochemicals division.

Polisul is assuming the domestic market for ethylene oxide will be 148,000 ton in 1989, and that by 1992 consumption should reach 184,000 on/year. Polisul's main contender will e Oxiteno, the sole Brazilian producer. For hdPE supply, Polisul will compete with Polialden and Electro Cloro.

Meanwhile, at Triunfo, Polisul is completing a $55m investment aimed at increasing hdPE capacity to 220,000 ton/year. Vieira says the company will boost its turnover from $90m to some $220m/year from 1990.

Ipiranga is also considering moving into the bisphenol and acetone deriatives business at Triunfo. It has detailed a $30m project for bisphenol in a joint venture with an undisclosed partner, which will supply the technology. It intends to create a wholly-owned company for its acetone derivatives business, and then to select available technologies for acquisition. Petroclor, the 55/45 joint venture between Petropar holding and Solvay's Electro Cloro, has received conditional approval from the Industrial Development Secretariat (SDI) for its $450m investment project at Triunfo.

According to an SDI spokesman, the requirements imposed do not represent an additional onus for Petroclor. The company has to agree not to get involved in any new petrochemical projects until the SDI considers the Triunfo investments are irreversible. If this agreement is broken, Petroclor's associates could not apply for financial incentives or soft credits for an unspecified period of time.

The SDI has imposed the requirements to clear up what the government considers a risky investment proposal which may wreck the medium-term feasibility of Petroclor's plans. The proposed VCM/PVC facility would have a capacity of 180,000 ton/year.

EDN is to put forward to the SDI a $180m investment proposal for an ethylbenzene/styrene monomer/PS project at Itaguai. It would have capacity for 240,000 ton/year ethylbenzene, 150,000 styrene monomer and 50,000 ton/year PS.

EDN's chairman says the company is becoming a major player in the Brazilian market. It already operates facilities at Camacari for 170,000 ton/year ethylbenzene, 150,000 ton/year styrene and 50,000 ton/year PS. In addition, at Guaruja, Sao Paulo State, EDN has a 75,000 ton/year PS plant using feedstock from Camacari. EDN obtains the project at Itaguai, the company says supply to Guaruja would be simplified.

Also, the 240,000 ton/year ethylbenzene capacity would be able to supply Petroflex, which uses the same feedstock and is expanding its synthetic rubber capacity at Rio.

CARBIDE FORMS OXO VENTURE

Union Carbide Brasil Ltd. and Elekeiroz do Nordesto Industria Quimica SA (Eniq) are to form a joint venture to produce oxo chemicals at a new plant in Camacari, Bahia state, Brazil.

The new project is to be known as Elekeiroz da Bahia SA and will produce butanols and 2-ethylhexanol using a flexible capacity system which allows the amount of each chemical produced to vary. The facility will have a nominal capacity of 80,000 ton/year.

The plant will utilize the Union Carbide/Davy-McKee/Johnson-Matthey low-pressure oxo technology which is licensed for worldwide use, and incorporate the most recent developments within the process. It is expected to go into production by mid-1992.

Product from the facility is intended for both the domestic and export markets, with Union Carbide Brasil, a subsidiary of Union Carbide Chemicals and Plastics Co. Inc. (UCC&P), dealing with the marketing of exports and Eniq, a subsidiary of Brazilian company Investimentos Itau SA. (Itausa), providing domestic marketing services, The combined investment in the joint facility amounts to $160m, with Eniq holding the majority interest. "Itausa intends to make the necessary investments in the chemical industry to participate in the growth forecast for chemicals for the next five years," said Olavo Setubal, Itausa's Chairman.

WEATHERLY PICKS UP NITRIC AWARD

Weatherly Inc. has been awarded a contract to design and provide equipment for a nitric acid (65 per cent weight) facility for First Chemical Corp, a wholly-owned subsidiary of First Mississippi.

The plant is to be situated in Pascagoula, Mississippi, and will have a capacity of 77,000 ton/year. It is scheduled to go on-stream in January 1991.

Weatherly is a wholly-owned subsidiary of Chematur International AB of Karlskoga, Sweden. It specializes in nitration technology, including fertilizers and nitric acid. Its nitric acid facilities utilize the company's unique mono-pressure vertical design and by 1991 the Pascagoula plant will be the eighth such unit to go into production.

The company's technology is already used in one such facility in Mississippi, along with two others in Israel and Australia. Four other plants are currently under construction; one in Indonesia scheduled to go on-stream in February 1990, plus two in India and one in South Korea, all of which are expected to go into production in October 1990.

DU PONT EXPANDS US NYLON UNITS

In the latest step in its ongoing expansion programme, Du Pont has announced plans to expand nylon polymers capacity and compounding facilities at its Parkersburg, West Virginia plant. Total expansion of the two plants will be around 45,000 ton/year at a cost of around $50m, said a company spokesman.

Du Pont says the move will enable it to improve its ability to meet increased world demand for nylon, acetals and polyesters, as well as to provide more specialized compounds on short notice.

The investment includes a series of expansions by the company in Europe and Asia, as sources say that demand for engineering polymers is increasi approximately 8 per cent in the U Europe and by around 10 per ce Asia.

EMS-INVENTA SIGNS THAI NYLON-6 DEAL

Ems-Inventa AG is to design supply a SF38m ($23.4m) nylon-6 f ity for Thai Taffeta Co. Ltd. The will be located near Bangkok and have a capacity to produce 12,000 t year of nylon-6 filament yarn. It is sc duled to go on-stream in late 199

EMS-Inventa is to be responsible only for the design and engineering the new plant, but also for the purch and delivery of equipment and the tra ing of personnel. It will also overs construction work on the facility a supervize its start-up.

News from Japan

INT ETHYLENE-CENTRE NTURE ADVANCES TOWARD ALIZATION

Mitsui Toatsu Chemicals, Inc. and e Industries, Ltd. have taken a new p towards implementing their ylene-center project by establishing 50/50 joint company called West pan Petrochemical Development rp. Senior Managing Directors H. imino and Y. Nishida of Mitsui atsu and Ube, respectively, have sumed the post of representative rectors of the new company.

The joint company is scheduled to nduct feasibility studies on the joint nture and related environmental sessment. Osaka Petrochemical Indus- es, Ltd. -- owned mainly by Mitsui atsu and Ube -- will take the leader- ip in implementing the joint venture med at building a 500,000 ton/year thylene plant in an industrial zone cated in Ube and Onoda Cities, amaguchi Prefecture.

The planned plant site is equipped ith a harbour and loading/unloading cilities and is convenient for rece- ing/stocking of raw material and ship- ng products. It is adjacent to plants longing to Seibu Sekiyu, Chubu Elec- ic Power, Ube Ammonia and Ube dustries. Since the Industrial Reloca- on Promotion Law has been applied to e industrial zone, those who have built ants there are able to obtain low- terest loans and receive favorable eatment with regard to taxes.

The date for plant construction has t to be fixed since it is necessary to ok into the supply-and-demand situ- ion for petrochemical products and the ends of petrochemical operations both home and overseas. Director M. Ta- ahashi of MITI's Basic Industries ureau comments on the joint venture, aying: "I think the two companies are onsidering building up their ethylene-supply capacity in proportion to actual demand for the product. I hope they will work out an adequate business plan for ethylene derivatives and push ahead with the project in a manner that does not hinder the healthy progress of Japan's petrochemical industry."

CHEMICAL PRODUCT DECLINE SEEN FOR 2ND HALF OF 1990

Economic Planning Agency has issued a report following a round-table meting held mid-November 1989 on general business conditions, with economic organizations representing 11 different sectors, including trading and electronics concerns. According to the report, Japanese trading firms may see domestic consumption of chemical products, which has been on the rise, slowing down during the second half of 1990. It also predicts an increasing dependence on the Middle East as an oil source. Along with changing expectations of industry and economic management, people are calling on the government to take action regarding Japan's recently introduced consumption tax, maintain the current level of economic expansion, and adjust import tariffs to promote imports of finished products.

The report containing summaries for industry as a whole is divided up by business sector. The viewpoint of the trading firms which attended the meeting merits some attention, focussing as it does on a possible slowdown in the previously increasing Japanese consumption of chemical products, in particular. Regarding exports: despite instability in China, exports to the country are expected to increase in the latter part of 1990. Regarding energy: as already deep-rooted needs continue increasing, Japan's imports of petroleum products and liquid natural gas are expected to increase, along with dependence on the Middle East for crude oil. Regarding cement: just as increases were forecast for 1989, cement should see a demand rise in 1990, following high demand in the private sector. Regarding textiles: other than ladies' knitwear, this area is expected to enjoy generally robust demand. Domestic production is likely to be sluggish in the face of rapidly increasing imports.

RESEARCH ON ULTRALARGE-SCALE PROJECTS KICKED OFF: MITI AGENCY

MITI's Agency of Industrial Science and Technology has commissioned private research organisations with studies on ultralarge-scale projects covering environmental problems, remedies for cancer and AIDS, energy supply, promotion of scientific technology throughout the world, establishment of international data bases and construction of large-scale research facilities, etc.

The agency expects the projects to help improve social systems and foundations for people's lives and solve world-wide problems. The said studies will be completed by March this year and the said private organisation will select themes suit able for the projects: the themes will be screened by an ad hoc committee attached to Industrial Technology Council -- an advisory panel to the International Trade and Industry Minister. The committee will compile an interim report shortly.

High hopes are placed on Japan's technical contribution to the world community since she has come to hold topnotch industrial technology and its economy accounts for a little over 10% of the world economy. The agency feels the necessity of Japan's working out ultralarge-scale projects in a bid to promote the world's scientific technology and settle global problems.

AGROCHEMICAL DELIVERIES SHOW NEGATIVE GROWTH FOR 3RD STRAIGHT YEAR

Demand for agrochemicals showed a year-to-year decrease for the third

straight year in the 1989 pesticide year. Society of Agricultural Chemical Industry (Japan) recently issued a report on agrochemical deliveries in the 1989 pesticide year. According to the report, volume recorded 455,091 tons and value, ¥361,688 million, falling 5.4 and 0.3% from the previous year, respectively.

Agrochemical deliveries showed negative growth in the 1987 pesticide year for the first time in history and the 1989 pesticide year's year-to-year decrease was the third in a row. The cost decrease came about mainly because of the government's rice-acreage-reduction policy, generally few occurrences of diseases and pests, price reduction enforced for the third consecutive year and rising public opinion favoring minimal use of agrochemicals. In particular, deliveries of paddy-field agrochemicals -- a major item among agrochemicals -- decreased sharply especially around western Japan. The society says that agrochemicals demand is not likely to increase steeply in the future either. (See table).

STYRENE MONOMER EXPORTS TO SOUTH EAST ASIA RISE SHARPLY

Exports of styrene monomer (SM) are going through the roof. The total for the first 10 months of this year comes to 150,000 tons, already nearly doubling the 80,000 ton figure achieved for the whole of last year. Japanese producers managed to keep up with this expansion by "debottlenecking" operations and reactivating mothballed furnaces. This, along with a steady decline in international market prices, and a healthy rise in demand for polystyrene and ABS resins (important demand sectors for styrene monomer), have all been contributing factors in this remarkable ri in exports to the Southeast Asia market.

Among the countries included in thi are South Korea, Taiwan, Hongkon and Thailand, which together accoun for over 20,000 ton/month on an aver age. The forecast total for the entire yea is around 200,000 tons. In relieving th unusually tight short term squeeze o supply, the international market grew slack, and spot prices in particular collapsed. This happened in part due to a drop in prices for raw materials, ethylene and benzene, also because the world's suppliers, Japan especially, were ready to expand to offset the crunch. With fears of an unstable supply diminishing, spot prices declined all through the summer.

In Japan, Idemitsu Petrochemical and Mitsubishi Petrochemical both started off by putting mothballed furnaces back on line, then streamlining production to cope with the needed expansion in production last year. Other manufacturers followed suit. This left them with excess export capacity. In Southeast Asia, the use of polystyrene in home appliances and packaging materials especially has been growing steadily. Production of ABS resin has been on the rise in Taiwan, and there have been some problems in South Korea. All of these have contributed to the rapid increase in demand for styrene monomer. At the same time that the market regains some stability, signs of a year-end price hike and other hints of rising prices may cause demand get out of hand at the year's end. It was these circumstances that served as a background for the year's rising exports in styrene monomer, which levelled off at an average of 20,000 tons/month. The result of this is that exports for the period January-October broke the 150,000 ton level, almost doubling 1988 figure. Overseas demand should remain as strong ever, maintaining the 20,000 tons/month level; for an annual figure close to 200,000 tons.

Agrochemical deliveries in 1989 pesticide year (in tons, kl, %, ¥1 million)

	Volume	PY 89/PY 88 %	Value	PY 89/PY 88 %
Paddy field				
Insecticides	82,742	83.4	33,546	89.3
Fungicides	48,078	97.8	29,550	101.7
Insecticide-Fungicides	55,262	90.5	22,990	92.9
Herbicides	108,036	97.5	64,472	102.7
Subtotal	294,118	91.8	150,558	97.7
Fruit trees				
Insecticides	17,701	101.3	26,515	102.1
Fungicides	16,743	94.2	26,395	105.9
Insecticide-Fungicides	43	113.2	148	111.3
Herbicides	4,605	98.9	11,384	103.6
Subtotal	39,092	97.9	64,442	103.9
Vegetables/upland crops				
Insecticides	51,638	99.0	50,102	98.3
Fungicides	24,841	105.7	35,479	103.8
Insecticides-Fungicides	2,554	96.5	1,248	104.5
Herbicides	23,745	101.2	23,217	100.4
Subtotal	102,778	101.0	110,046	100.5
Others	19,103	95.6	36,642	98.3
Total	455,091	94.4	361,688	99.7

New developments from Japan

UMITOMO METAL LAUNCHES NTO NEUROCOMPUTER BUSI-NESS

In a bid to diversify into neuro com-uter operations, Sumitomo Metal ndustries, Ltd. has obtained from Olm-ted & Watkins (California), the (U.S.) he exclusive marketing rights -- valid or Japan -- for the U.S. firm's "OWL" oftware for use in the development of eural network systems. OWL incor-orates 10 types of network model ncluding back propagation and pop-field types. It can be run on personal computers and UNIX workstations and facilitates formation of network systems using the C language. The Japanese company intends to make the most of OWL by itself and market it in a price range of ¥500, ~ 950,000.

In a related development, the com-pany plans to pioneer "Neuroviser" neuronetwork simulator using the OWL software. The targeted simulator is for beginners and compatible with PC-9801 personal computers: it will be priced at ¥65,000. Neuroviser will facilitate pat-tern recognition, control of machinery and treatment of information and sig-nals, thereby encouraging development of neural network-applied systems. OWL and Neuroviser will be marketed from January 1990.

Sumitomo Metal has hitherto applied artificial intelligence (AI) based expert systems to the checking of blast furna-ces and optimization of conveyor lines. The drawbacks of conventional expert systems are, however, that it takes a lot of time and labor to establish rules on the basis of experts' knowledge and rules thereby established often prove unsuitable for actual conditions.

The company aims at applying neural networks to expert systems, thereby creating systems capable of establishing new rules by themselves and expanding application fields for the systems.

THREE-YEAR DEEP-SEA BIO-SCIENCE PROJECT WORKED OUT: GOVERNMENT AGENCY

Science and Technology Agency is scheduled to inaugurate next fiscal year a three-year project aimed at promoting research on deep-sea life having unique properties. The agency plans to develop several types of equipment designed to gather deep-sea microorganisms and carry them to land while maintaining the deep-sea pressure they are accustomed to, and separate and cultivate them under the same conditions as in the deep sea.

It is believed that living things in the deep sea include chemical-synthesis germs capable of taking in hydrogen sulfide and hydrocarbon without employing a photosynthesis process. Many of the germs have been found at the deep-sea bottom where hot water is being spouted. It is thought that they must conduct unique chemical reactions and have metabolic functions completely different from those of life on the ground. Elucidation of their functions is expected to result in the discovery of new enzymes and physiologically active substances, thereby facilitating production of new pharmaceuticals and improvement of industrial processes.

For example, it may be possible to develop new pollution-control technology by taking advantage of deep-sea microbes' resistance to heavy metals. The said project will encourage research on "deep-sea bioscience," which calls for the establishment of the same circumstances as in the deep sea. It is quite difficult to carry out such research using only conventional facilities including submarines.

UNIQUE JAPANESE PURE-TI TOOTH ROOT TO BE ON MARKET FOR 1ST TIME

Toho Titanium company will soon market a tooth root made of pure titanium and designed to shorten the period required for dental treatment. It will be the first titanium-made biomimetic material to be supplied by a Japanese firm. The new product dubbed "Ti-ROOT" has its bottom tip made porous so that the living tissue in which the tooth root has been implanted can enter its pores to catch it firmly. This helps to shorten the period needed for dental treatment compared with the case of using conventional titanium roots without such pores, the company says.

Clinical tests at a hospital show good results and the company has built production facilities for the artificial tooth root at its Chigasaki factory to prepare for commercial production as it is likely to obtain manufacturing approval for it soon. Titanium is light (its specific gravity is less than one-half that of iron) and has a very high strength-to-weight ratio. It also has a good anticorrosive property and so is a good biomimetic substance to be implanted in the body.

In Japan, Sumitomo Metal Industries, Ltd. which is producing expanded titanium products has developed a titanium tooth root and several other companies are also carrying out R&D on the tooth root. None of them, however, have started commercial production as yet.

RESEARCH ON "INTELLIGENT MATERIAL" SHOULD BE STEPPED UP: REPORT

Aircraft/Electronics Technology Council recently compiled a report on R & D for "intelligent material." In this report, "intelligent material" is defined" as "material capable of responding to changes in circumstances." The council claims that intelligent materials include sensors, electronics materials --both of which are capable of forming adequate "judgements" in response to stimulation - and capsules designed to release drugs depending on the physical condition of those who have taken them.

It recommends that studies be conducted on how to develop basic functions of responding to changes in circumstances and combine them in a single material. Current research on high-tech materials is aimed at making targeted material perform only a single function.

It also advises that the functions be materialized on an atomic/molecular basis as a first step. It is necessary, the council adds, to conduct research on intelligent material based on the following: (1) promotion of all-round R & D work, (2) increase in the number of related researchers and promotion of information exchange among them, (3) development of related fundamental technology and (4) international cooperation. The report refers to "the government's positive approach" toward development of intelligent-material technology regarded as a promising one for the coming age. Science and Technology Agency intends to embody the content of the report in government policies.

POLYMER TURNED HYDROPHYLIC THROUGH GRAFT POLYMERIZATION

A research group at College of Engineering, Kyoto University has succeeded in turning hydrophobic polymer -- poly (1-trimethylsilyl-1-propyne) film -- hydrophylic by adding hydrophylic monomer (acrylic acid) thereto using photo- and plasma- initiated graft-polymerization processes.

Gas and dissolved oxygen are capable of easily passing through the polymer developed by the research group. The polymer is, however, originally hydrophobic and studies have hitherto been conducted on how to turn the product hydrophylic. The technical breakthrough attained by the research group will expand application of the promising polymer -- usable as an oxygen-enriching film -- to contact lenses.

In the plasma-initiated gra polymerization process, the surface the poly-TMSP film is oxidized plasma (ionized electric current: 6 m pressure: 0.2 torr) and the resultant fi is exposed to air at room temperatu for 10 days; it is then immersed acrylic-acid solution for 24 hours f graft-polymerization purposes. As result, the film becomes hydrophyl with only its surface graft polymerize

In the photo-initiated graft-pol merization process, light is emitted on the poly-TMSP film, which, as a follow up step, is immersed in acrylic-aci solution (concentration: 10%) for graf polymerization purposes. In this cas graft-polymerization is caused not onl at the film's surface but also within th film itself. The light is radiated from 400W high-pressure hydrogen lamp on to the film in air with temperature and distance set at 30°C and 5cm, resp.

MARKET INFORMATION

Market Steady

Prices of most chemicals remained at the previous weeks levels. Ready availability of materials ensured regular supplies to consumers. Acetic anhydride went up by Rs. 2 per kg to Rs. 37 per kg. Formic acid decreased marginally by Re. 1 and remained at Rs. 23 per kg. Dyes and intermediates ruled around the previous weeks levels.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on January 16, 1990)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	2.50
Ammonium phosphate (Mono)	14.50
Ammonium phosphate (Di)	14.00
Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	5.60
Ammonium chloride	4.00
Ammonium nitrate	6.00
Arsenic white powder	22.00
Acrylamide (Resale)	70.00
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.20
Borax (Granular)	18.00
Borax (Powder)	22.00
Boric acid (Tech)	26.00
Bisphenol-A	70.00
Butyl carbitol	110.00
Caustic soda (Flakes)	11.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	300.00
Cresylic acid	62.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	47.00
Copper sulphate	25.00
Chromic acid	63.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	110.00
Hydro	44+ST

Hyflosupercell	21.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	20.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	40.00
Mercury (34.5 Kgs)	10,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	16.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	25.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	23.00
Phthalic anhydride 36% (Resale)	23.00
Pentaerythritol (Resale)	45.00
Paraffin wax	19+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	70.00
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	730.00
Sodium chlorite 80% (Spain)	84.00
Soda Ash (Tata)	4.80
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	8.00
Sodium alginate	320.00
Titanium Dioxide (Anatase)	80+ST
Titanium Dioxide (Rutile – RCR_2)	112+ST
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	78.00
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	37.00
Acetone (Resale)	20.50
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	47.00
Benzoate Plasticiser	62.00
Butyl acrylate	84+ST
Butyl stearate	45.00
Butanol	35
Benzyl Alcohol	60
Benzyl Chloride	34
Benzo trichloride	16
Benzoyl chloride	22
Bromine Liquid	60
Chloroform	31
Carbon Tetrachloride	21
Cellosolve	58
Cyclohexanone	52
Cyclohexanol	58+
Diacetone (Resale)	34
Diethyl Oxalate	34
Diethyl glycol (DEG)	32
Dioctyl Phthalate	45
Diallyl Phthalate	46
Dimethyl Phthalate	28
Dioctyl Adipate	52
Dibutyl Adipate	42
Dipentene	15
Dimethylamine 40%	26
Dimethylamine 50%	30
Ethyl Acetate	20
Ethyl Acrylate	72
Ethylene Dichloride	14.5
Ethylene Glycol	38
Formic Acid (Imp.)	23.00
Formaldehyde (Resale)	7.50
Glycerine (CP)	55.00
Glycerine (IW)	53.00
Hydrogen Peroxide 50% (Resale)	26.00
Isopropyl Alcohol	29.00
Isobutyl Alcohol (Resale)	30.00
Monoethanolamine (Resale)	90.00
Melamine	60.00
Methyl Ethyl Ketone	64.00
Methyl Isobutyl Ketone	58.00
Methyl Acrylate	66.00
Methylene Dichloride (Resale)	16.00

Meta Cresol	45.00
Nitrobenzene	25.00
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	36.00
Propylene Glycol	55.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	62.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	38+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	71.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	11.00
N-Heptane	10.50
N-Hexane	13.00
Methanol	9.50
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	13.50
Xylene	18.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	170.00
Aceto Acetic Ester (Methyl)	66.00
Ammonium Molybdate	210.00
Anthraquinone	120.00
Anthranilic Acid	78.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	257.00
Beta Naphthol (Atul)	75.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid	550.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	355.00
Coach Acid	52.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	140.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
Diethyl Aniline	160.00
Diamino stilbene disulphonic acid	168.00
3,3-DCB (Imp.)	175.00
Gamma Acid (Atul)	205.00
H. Acid (Atul)	107.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	350.00
J. Acid Urea	410.00
K. Acid	125.00
MPDS (German)	185.00

Meta Ureido Aniline	23
MPD (Local)	205
MPD (Japan)	220
Naphthenic Acid	25
N-Methyl J. Acid	580
N-Methyl Aniline	125
Naphthalene (Refined)	23
Ortho Anisidine (OA) (Imp.)	108
Ortho Dichloro Benzene (ODCB)	16
OT Base	130
Para Dichloro Benzene (PDCB)	32
Para Anisidine (PA local)	160
PNA	120
Para Cresidine (Imp.)	410
Para Amino Azo Benzene (India)	150
PNCB	62
Para Amino Acetanilide	190.0
1-Phenyl 3-Methyl 5-Pyrazolone	140.0
Phenyl J. Acid	340.0
Para Amino Benzoic Acid	165.0
PT Base	140.0
Rhoduline Acid	550.0
Resist Salt 80%	28.0
Resorcinol	205.0
Sodium Naphthionate	67.0
5-Sulpho-Anthranilic Acid	80.0
Sulphanilic Acid	33.0
Sulpho Tobias Acid	170.0
Trichloro Benzene (TCB)	24.0
Tobias Acid	166.0
Metanilic Acid	43.0
ITD	120.0

Madras Market

Prices maintained previous levels without much change in the Madras chemicals market. Titanium dioxide rutile was quoted at Rs. 108 per kg but with very little business done. Enquiries for xylene, toluene and acetone were good and there was moderate activity in these items.

(MADRAS MARKET RATES AS ON JANUARY 13, 1990)

Acetic Acid Glacial (per kg)	15.00
Aluminium Sulphate Iron free (per MT)	4,000.00
Ammonium Bicarbonate (per 25 kgs)	150.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	31.50
Barium Carbonate (per kg)	9.00
Barium Chloride (per kg)	8.00
Boric Acid Technical (per kg)	24.00
Bleaching Powder (per 50 kgs)	225.00
Borax (per 50 kgs)	700.00
Caustic Soda Flakes – Mettur Chemicals (per MT)	10,500.00
Caustic Soda Flakes – Andhra Sugars (per MT)	10,500.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,500.00
Calcium Carbonate (Activated) (per MT)	6,000.00
Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	90.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	48.00
Hydrosulphite of Soda (TCPL) (per kg)	36.00
Hydrosulphite of Soda (IDI) (per kg)	40.00
Hydrosulphite of Soda (BASF) (per kg)	40.00
Hexamine (per kg)	31.00
Hyflosupercell (per kg)	19.50
Hydrogen Peroxide (per kg)	31.50
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	18.00
Magnesium Chloride (per kg)	3.5
Maleic Anhydride (per kg)	40.0
Menthol Crystals (per kg)	350.0
Oxalic Acid (per kg)	20.0
Paraffin Wax (per kg)	17.0
Potassium Bichromate (per kg)	36.0
Phosphoric Acid (per kg)	25.5
Polyvinyl Alcohol Powder (per kg)	130.0
Pentaerythritol (per kg)	50.0
Phthalic Anhydride (per kg)	30.0
Soda Ash (TAC) (per 75 kgs)	350.0
Soda Ash (TATA) (per 75 kgs)	350.0
Sodium Bicarbonate (TATA) (per 50 kgs)	375.00
Sodium Silicate (per MT)	3,500.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	230.00
Sodium Acetate (per kg)	7.50
Sodium Sulphate (Anhydrous) (per kg)	3.50
Titanium Dioxide (Anatase) (per kg)	75.00
Titanium Dioxide (Rutile) (per kg)	108.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	52.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	7.00

SOLVENTS

Acetone -- HOCL (per kg)	22.50
Butanol (per kg)	36.00
Butyl Acetate (per kg)	42.00
Benzene (per lit)	14.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	23.00
Chloroform (per kg)	29.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	38.00
Dichloroethane (per kg)	18.00
Di-octyl Phthalate (per kg)	42.00
Di-N-butyl Phthalate (per kg)	42.00
Ethyl Acetate (per kg)	21.00
Isopropyl Alcohol (per kg)	30.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	22.00
Methyl Ethyl Ketone (per kg)	34.00
Methyl Isobutyl Ketone (per kg)	42.00
Phenol (per kg)	38.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	65.00
Trichloroethylene (per kg)	26.00
1-1-1 Trichloroethane (per kg)	29.00
Turpentine (per lit)	16.50
Toluene (per lit)	16.00
Xylene (per lit)	23.00

Delhi Market

DELHI: JAN. 12, (NNS) Mercury jumped up sharply by Rs. 900 and touched a new peak level of Rs. 11,900 per flask in the Delhi chemicals market during the week under review on account of negligible stock in the market as well as higher advices from Bombay says NNS. As a result of supply being stopped by the Modis and on account of the heavy demand by stockists, caustic soda flakes spurted sharply by Rs. 60 at Rs. 535/50 kg.

In view of the dwindling supply, camphor powder and thal rose by Rs. 1/2 at Rs. 95 and Rs. 104 per kg. In the wake of fall in arrivals from Sambhal, Muradabad, Rampur, Chandausi and Amroha areas of U.P., menthol medium and bold rsoe by Rs. 15 each at Rs. 390 and Rs. 405 per kg. Menthol flake also recorded a rise of Rs. 10 at Rs. 362 due to shortage of stock. Menthol oil moved by Rs. 8 at Rs. 260/280 and DMO quoted higher at Rs. 125 instead of Rs. 120.

On reports of arrival of about 800 tonnes of imported quality from Bombay, chatkolite suffered a steep fall of Rs. 6 at Rs. 56 per kg due to lack of consumption. In the last week of Nov. 89 the prices of this commodity were quoted higher at Rs. 90. Sufolite lost Rs. 2 due to sufficient stock and poor support. Rangolite also came down further by Re. 1 in the absence of demand from textile units.

Boric acid technical and tartaric acid France declined by Rs. 50/100 at Rs. 1,350 and Rs. 13,600 per 50 kg in the absence of demand. As a result of fall in demand from plastic and paint units, titanium dioxide anatase and RC-822 moved down again by Rs. 1/3 at Rs. 81 and Rs. 95. K brand also softened by Re. 1 at Rs. 74. RCR-2 sold higher at Rs. 105 against Rs. 110 per kg due to slack enquiries. No variation was noticed in most of the dyes and colours during the week for want of support.

(DELHI MARKET RATES AS ON JANUARY 12, 1990)

Ammonia Bicarb (Per 25 Kg.)	140.00
Mercury (Per flask)	11,900.00
Soda ash (Per bag)	340/346.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	535.00
Citric acid (Per 50 Kg.)	2,050/2,350.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	101.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00
Sodium Bicarbonate (50 Kg.)	285/290.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	83.00
Tartaric acid (Imp) (50 Kg.)	13,600.00
Sufolite (per Kg.)	70.00
Chatkolite (per Kg.)	56.00
DMO	125.00
Boric acid Technical (Per 50 Kg.)	1,350.00
Paraffin Wax (Per 50 Kg.)	850.00
Tartaric Acid (Indian Per 15 Kg.)	4,150.00
Borax Granular (Per 50 Kg.)	835.00
Borax Crystal (Per 50 Kg.)	835.00
Sodium Nitrite (Per 50 Kg.)	800/900.00
Sodium Nitrate (Per 50 Kg.)	450.00
Camphor Thal (Per Kg.)	104.00
Camphor Powder (Per Kg.)	95.00
Menthol Bold (Per Kg.)	405.00
Menthol Medium (Per Kg.)	390.00
Menthol Flake (Per Kg.)	362.0
Menthol Oil (Per Kg.)	260/280.0
Glycerine (Per Kg.)	55/58.0
Sodium Silicate (Per quintal)	275/350.0
Hexamine (Per Kg.)	35.0
Acetic Acid Glacial (Per Kg.)	15.0
Copper Sulphate (Per quintal)	2,400/2,75
Formic Acid (Per Kg.)	24.0
Formaldehyde (Per Kg.)	8.5
Hydrogen Peroxide (Per Kg.)	25.75/26.2
Calcium Carbonate (Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	28.00
Acid Slurry Hard (Per Kg.)	38.00
Phosphoric Acid (Per 50 Kg.)	1,050.00
Potassium Nitrate (Per quintal)	900/1,200.00
Potassium Permanganate (Per 50 Kg.)	2,800/3,200.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	600.00
Titanium Dioxide Anatase (Per Kg.)	81.00
Titanium Dioxide RC-822 (Per Kg.)	95.00
Titanium Dioxide K-Brand (Per Kg.)	74.00
Titanium Dioxide RCR-2 (Per Kg.)	105.00
Zinc Oxide (Per metric tonne)	42,000/48,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.75
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	3,400/3,700.00
Naphthalene Balls (Per 50 Kg.)	1,500.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/201.65
Naphthol ASG	180/295.20
Naphthol ASBS	210/248.45
Naphthol ASTR	275/360.45
Naphthol ASOL	210/238.60
Naphthol ASBO	195/260.75

DIRECT DYES	(Per Kg.)
Black E. Conc.	120/176.90
Diazo Black B.T.	105/147.55
Green B	90/140.55
Blue 2-B	60/101.40
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/235.05
Basic Auramine	55/110.00
Basic Rhodamine	300/425.00
Basic Methylene Blue	100/180.00
Basic Violet	165/210.00
Basic Malachite Green	175.00
Acid Orange	75/111.20
Congo Red H/C	75/120.95

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
19/1	Lanka Aruna	Seahorse	New York; Baltimore; Charleston; Norfolk. (Carting at M.O.D. No. 3).	24/1
19/1	Maersk Clementine (Sing)(V-9002)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; Sanfrancisco; Portland; Longbeach; Mexican & S. American Ports. (Carting at M.O.D. No. 2).	24/1
18/1	Moji (Voy-16)	Samrat/	Longbeach; Oakland; Seattle; Los Angeles; Sanfrancisco; Philadelphia; Savannah; Charleston; Baltimore; Norfolk; New York; Boston; St. John; Vancouver; Montreal; Toronto; New Orleans; Houston. (Carting at M.B.).	24/1
		U.L.A./	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax; Montreal; Toronto; S. American and West Indies Ports. (Carting at M-171/173 C.D.).	24/1
		E.S.P.L./	Longbeach; Charleston; New York; St. John; Norfolk; Oakland; Vancouver (B.C.); Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; Longview; Los Angeles; New Orleans; Philadelphia; Portland; San Diego; Mexico City; San Francicso; Siouxfall; Sacramento; Stockton; Halifax; Toronto; Savannah; Tacoma; Miami and all other destinations. Also Caribbean ports. (Carting at Mallet Bunder)	
		Trident/	S. American; Carribean and Central American ports. (Carting at T.P. No. 4).	24/1
		Arebee	S. American ports. (Carting at M-Jetha Cotton Depot).	
20/1	Eagle Star (V-026)	F.F.C. Co.	Los Angeles (Harbour); Longbeach; San Francisco; Oakland; Seattle; Vancouver (B.C.); Portland; New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Toronto; Fortworth; Chicago; Nashville; Atlanta; Philadelphia; Milwaukee; Kansas City, Phoenix; Guam; Dallas; Cleveland; St. Louis; Cincinnati; Denver; Louisville; Memphis; Wilmington (B.C.); San Diego; Minneapolis; Indianapolis and Central American Ports; Honolulu. (Carting at Timber Pond No. 1).	25/1
23/1	Chandidas (Ind)	S.C.I.	New York; Baltimore; Savannah (Direct) and other inland destinations (Carting at Timber Pond No. 1).	26/1
1/2	Sam Houston (Ame)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	1/2
19/1	Olandia	Merzario	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Blassa. (Carting at M.O.D. No. 2).	25/1
18/1	Moji	U.L.A./ Trident	Lagos/Aqapa; Abidjan; Lome/Matadi. (Carting at M171/173 C.D.)	24/1
			Tema/Lome; Lagos; Matadi; Lobito; Luanda; Freetown; Cotonou; Douala; P. Harcourt; Abidjan; Monrovia; Dakar. (Crtg. at T.P. No.4).	
19/1	Maersk Clementine	V. Fleming	Lagos/Aqapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala; Tema. (Carting at M.O.D. No. 2).	24/1
18/1	Moji	Kanika	Antwerp; Rotterdam; Hamburg; Le Havre; Genoa; Gothenburg; Stockholm; Copenhagen; Oslo; Helsinki; London; Felixstowe; Tilbury. (Carting at T.P. No. 3).	24/1
20/1	Eagle Star	F.F.C. Co.	Jeddah; P. Sudan; Hodeidah. (Carting at Timber Pond No. 1).	25/1
1/2	Sam Houston	M.S.P.L.	Aqaba; Assab; P. Suez; (Alexandria). (Carting at P/Q-PD).	1/2
19/1	Olandia (Ger)	Samrat/ Hindustan/ Merzario/	Felixstowe; Hamburg; Rotterdam; Also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembley; Birmingham; Liecester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all Destinations in U.K. Benelux Germany; Italy; France; Switzerland and Austria. (Carting at M.O.D. No. 2 for Merzario) (Carting at M.O.D. No. 1 for Samrat & Hindustan).	25/1

(1)	(2)	(3)	(4)	(5)
19/1	Maersk Clementine	Volkart Fleming	Leghorn; Marseilles; Naples; Barcelona; Bilbao; Bordeaux; Alicante; Genoa; Valencia; Bremen; Jeddah; Antwerp; Rotterdam; Bremerhaven; Hamburg; U.K. & Scandinavian ports. (Carting at M.O.D. No. 3).	24
19/1	Lanka Aruna (Phi)	Seahorse	Hodeidah; Jeddah; Aqaba; Alexandria (Direct); Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Glasgow; Wembley; Liecester; Immingham; Birmingham; Leeds; Antwerp; Bremen; Copenhagen; Gothenburg; Hamburg; Rotterdam; Oslo; Stockholm; Helsinki; Aarhus; Malmao; Norkopping. (Carting at M.O.D. No. 3).	24/
22/1	Mareike	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah.	28/
23/1	Chandidas (Ind)	S.C.I.	P. Said; Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Le Havre; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Copenhagen; Gothenburg; Helsinki and all inland destinations. (Carting at T.P. No. 1).	26/
19/1	Lanka Aruna	Seahorse	Colombo. (Carting at M.O.D. No. 3).	24/1
20/1	Eagle Star	F.F.C. Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1).	25/1
25/1	Kalidas	S.C.I.	Colombo; Chittagong. (Carting at Timber Pond No. 1).	28/1
18/1	Moji (V-16)	Samrat/	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manla; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo. (Carting at Mallett Bunder).	24/1
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at T.P. No. 4).	
		U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese ports. (Carting at M-171/173 Cotton Depot).	
		E.S.P.L.	Singapore; Hongkong; Bangkok; Jakarta; Kaosiung; Keelung; Penang; P. Kelang; Kota Kinabulu; Kulaubelati; Bintulu; Kuching; Labuan; Vietnam (P.R.C.). (Carting at Mallet Bunder).	
		I.M.E./	Singapore; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at Wadi Bunder No. 3).	
		M.C.S./	Singapore; Hongkong; Keelung; Kaohsiung; Jakarta; Surabaya; Bangkok; Penang; P. Kelang. (Carting at H.B. No. 4 for M.C.S.).	
		Kanika	Bangkok; P. Kelang; Djakarta; Keelung; Busan; Hongkong. (Carting at T.P. No. 3).	
19/1	Lanka Aruna	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hongkong; Keelung; Kobe; Yokohama and FCL Only Busan; Inchon; Osaka; Tokyo; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).	24/1
19/1	Maersk Clementine (Sing)(V-9002)	Volkart Fleming	Penang; Singapore; Hongkong; Keelung; Kaohsiung; Busan; Main Japan Ports; Manila; Jakarta; Surabaya; Bangkok; P. Kelang; Chinese ports. (Carting at M.O.D. No. 2).	24/1
20/1	Eagle Star (V-026)(Cyp)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta; (T. Priok); Hongkong; Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Nagoya; Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at Timber Pond No. 1).	25/1
25/1	Kalidas	S.C.I.	Singapore and Far East ports. (Carting at Timber Pond No. 1).	28/1
18/1	Moji (V-16)	Samrat/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie. (Carting at M.B.)	24/1
		Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttelton. (Carting at T.P. No. 4).	
		Arebee/	Sydney; Melbourne; Adelaide; Brisbane. (Carting at M-Jetha C.D.).	
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at CFS Cotton Avenue).	
		Kanika/	Brisbane; Sydney; Melbourne; New Castle; Adelaide; Fremantle; Auckland; Wellington; Lyttleton. (Carting at Timber Pond No. 3).	
19/1	Lanka Aruna	Seahorse	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting at M.O.D. No. 3).	24/1
20/1	Eagle Star	F.F.C. Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting at T.P. No. 1).	25/1
25/1	Kalidas	S.C.I.	Melbourne; Fremantle; Adelaide; Sydney. (Carting at Timber Pond No. 1).	28/1
15/1	Ardal (Dan)	Mackintosh	Muscat; Dubai.	24/1

)	(2)	(3)	(4)	(5)
9/1	Maersk Clementine	V. Fleming	Dubai; Dammam; Muscat; Bahrain; Kuwait; Riyadh; Doha. (Carting at M.O.D. No. 2).	24/1
9/1	Lanka Aruna	Seahorse	Dubai; Khorfakkan; Sharjah; Muscat; Dammam; Riyadh; Kuwait. (Carting at M.O.D. No. 3).	24/1
0/1	Eagle Star (V-026)	F.F.C. Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Bahrain; Kuwait. (Carting at Timber Pond No. 1).	25/1
2/1	Mareike (V-899)	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha.	28/1

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
28/1	Jala Gopal	S.C.I.	U.S./Canada
27/1	Jala Murugan	S.C.I.	E. Africa
25/1	Kalidas	S.C.I.	Australia
28/1	Maestro	Sai Ship	S. America
24/1	Regine	Sai Ship	Cont./Med.
26/1	Vishva Mamta	S.C.I.	Cont./Med.

Materials Imported

RUG MATERIALS IMPORTED MADRAS
(From 1.12.89 to 5.12.89)
Continued from previous issue

OXYTHIAZINE JP: From China: Tamil Nadu Dadha Pharmaceuticals Ltd., 50 Kgs., Rs. 1,41,925.

PENICILLIN G POTASSIUM: From Netherlands: Benzex Labs Ltd., 949.5 Kgs., Rs. 4,00,701.

VITAMIN C BP 80: From Hong Kong: Tamil Nadu Dadha Pharm, 3,000 Kgs., Rs. 5,28,392.

MATERIALS IMPORTED MADRAS
(From 6.12.89 to 12.12.89)

N-ACETYL SULPHANILYL CHLORIDE: From Japan: Plant Organics Ltd., 17 MTs., 9,06,903.

ANTIOXIDANT: From Japan: Superfil Products Pvt. Ltd., 180 Kgs., Rs. 60,919.

AROMATIC CHEMICALS: From China: Bharat Industrial Corpn., 1,446 Kgs., Rs. 1,10,192; From Japan: N. Ranga Rao & Sons, 360 Kgs., Rs. 91,325.

BARIUM TITANATE: From Japan: Dalmia Cement (Bharat) Ltd., 50 Kgs. Rs. 35,922.

CAPROLACTAM: From Belgium: SRF Ltd., 1,42,000 Kgs., Rs. 42,08,505

CAUSTIC SODA FLAKES: From FRG: Standard Organics Ltd., 2,20,000 Kgs., Rs. 17,32,511.

3-CHLORO-4-FLUORO ANILINE: From Japan: Dr. Reddy's Labs Ltd., 5,000 Kgs., Rs. 7,71,206.

DIETHYLENE GLYCOL: From Japan: Meta Chem Services, 26,225 Kgs., Rs. 1,99,166.

DILAURYL THIODIPROPIONATE: From UK: SRS Filled Fibres Ltd., 1,200 Kgs., Rs. 1,21,438.

DIMETHYL DICHLOROSILANE: From FRG: Agipi Chemicals, 2,600 Kgs., Rs. 1,20,119.

4,6-DINITRO ORTHO CRESOL: From France: McDowell & Co. Ltd., 5,680 Kgs., Rs. 3,58,967.

DIPROPYLENE GLYCOL: From Thailand: Shalimar Agarbatti Co., 11,550 Kgs., Rs. 4,66,721.

DL-METHIONINE POULTRY FEED GRADE: From Japan: Oscar Feeds, 3,000 Kgs., Rs. 1,42,499.

ETHYLENE GLYCOL: From FRG: Elcot New Era Technologies Ltd., 2,200 Kgs., Rs. 63,246.

GAMMA FERRIC OXIDE: From Singapore: Prakash Pipes & Inds. Ltd., 6,000 Kgs., Rs. 5,40,159.

GUM BENZOIN: From Indonesia: B.A. Aswathiah & Bros., 200 Kgs., Rs. 30,595; From Singapore: Rasiklal and Co., 2,686 Kgs., Rs. 43,911; Sha Shantilal Indermall, 1,355 Kgs., Rs. 18,410.

HEXYLENE GLYCOL: From Japan: Peroxides India Ltd., 1,140 Kgs., Rs. 32,822.

HYDROXY PHENYL GLYCINE: From Netherlands: TTK Chemicals Ltd., 500 Kgs., Rs. 1,87,583.

ISOCETYL STEARATE: From USA: Prakash Pipes and Inds., 353.8 Kgs., Rs. 46,594.

METHYLENE CHLORIDE: From France: TTK Chemicals Limited, 19,000 Kgs., Rs. 1,83,091; From Netherlands: Pancom Marketing Pvt. Ltd., 19.44 MTs, Rs. 42,17,798; SOL Pharmaceuticals Ltd., 19.89 MTs., Rs. 2,11,589.

PARAFORMALDEHYDE: From Spain: Bond Chemicals Corpn., 20,000 Kgs., Rs. 1,92,340.

PARAHYDROXY PHENYL GLYCINE: From Singapore: TTK Chemi-

ls, 1,000 Kgs., Rs. 3,72,584.

PHENYL PROPYL ALCOHOL: rom Switzerland: Vasu Agarbathies, 00 Kgs., Rs. 54,718.

POLYVINYL ACETATE: From apan: Electronic Research Ltd., 20 Kgs., Rs. 7,339.

PROPIONIC ANHYDRIDE: From Japan: Pradeep Drug Co., 1,080 Kgs., Rs. 46,811.

PROPYLENE OXIDE: From FRG: Newland Labs Ltd., 2,080 Kgs., Rs. 89,166.

PYRIDINE: From Belgium: Metro Exporters, 10 MTs., Rs. 6,77,425; From UK: I.E.L. Ltd., 30,400 Kgs., Rs. 18,32,842.

PYRIDINE PURE: From Japan: Arandy Labs Ltd., 2.925 MTs., Rs. 1,96,943.

PYRIDINE PURE 2°C: From Japan: Benzex Labs Ltd., 5,070 Kgs., Rs. 3,41,368.

QUANYL ACETATE: From Netherlands: Padmini Products, 175 Kgs., Rs. 73,189.

SILICA FUMED: From FRG: Kanchan Agencies, 2,008 Kgs., Rs. 1,92,520.

SODIUM METAL: From FRG: IEL Chem Tech. Pvt. Ltd., 2,730 Kgs., Rs. 58,212; Siris Ltd., 17.9 MTs., Rs. 3,37,575; From Japan: Metro Exporters Ltd., 9.86 MTs., Rs. 3,50,669.

SOYA LECITHIN: From USA: Prakash Pipes and Inds. Ltd., 997.92 Kgs., Rs. 1,52,648.

SULPHUR INSOLUBLE: From Japan: Dunlop India Ltd., 17,000 Kgs., Rs. 4,46,254; MRF Ltd., 32,000 Kgs., Rs. 9,15,940; From UAE: Kamar Chemicals Inds. Ltd., 2,000 Kgs., Rs. 36,76,943.

TITANIUM DIOXIDE: From Switzerland: Sudha Chemicals, 205 Kgs., Rs. 27,040.

TOLUENE DIISOCYANATE MIXTURE: From FRG: Prakash Pipes Inds. Ltd., 2,220 Kgs., Rs. 1,64,921.

TOLUENE NITRATION GRADE: From Singapore: Elgi Polytex Ltd., 14,320 Kgs., Rs. 1,30,960.

TRIETHYLAMINE: From USA: Benzex Labs Ltd., 7,560 Kgs., Rs. 2,98,328.

ZINC OXIDE: From Singapore: W.S. Industries, 18,000 Kgs., Rs. 6,52,360.

PLASTIC MATERIALS IMPORTED MADRAS
(From 6.12.89 to 12.12.89)

HDPE: From Brazil: Jampex Enterprises, 115.75 MTs., Rs. 14,70,504; From Japan: Peacock Polymers (P) Ltd., 16,000 Kgs., Rs. 2,12,641; Rabbani Exports, 4.6 MTs., Rs. 60,522; From Netherlands: Lalith Polypacks (P) Ltd., 8.5 MTs., Rs. 1,04,366; Trimurti Associates (P) Ltd., 8,500 MTs., Rs. 1,04,366; From Singapore: Packarena Pvt. Ltd., 8,250 Kgs., Rs. 1,05,207; Swastic Corporation, 16.5 MTs., Rs. 2,24,878; Vijay Polyweaves Pvt. Ltd., 51 MTs., Rs. 6,56,055.

LDPE: From Belgium: Premier Cable Co. Ltd., 2 MTs., Rs. 50,807; From Singapore: Indo National Ltd., 16 MTs., Rs. 2,33,034.

POLYPROPYLENE: From Japan: Electronic Research Ltd., 34,000 Kgs., Rs. 4,40,326; From France: MM Rubber Co. Ltd., 32,500 Kgs., Rs. 5,24,898.

POLYSTYRENE HIGH IMPACT: From Korea: Shah Polymers, 18,000 Kgs., Rs. 2,59,115.

STYRENE MONOMER: From USA: Naphtha Resins and Chemicals, 17,600 Kgs., Rs. 2,83,164.

DRUG MATERIALS IMPORTED MADRAS
(From 6.12.89 to 12.12.89)

L DOPA BP 80: From Tamilnadu Dadha Pharmaceuticals Ltd., 200 Kgs., Rs. 3,61,851.

GRISEOFULVIN HP/USP: From China: American Remedies Pvt. Ltd., 250 Kgs., Rs. 1,99,328.

DYE MATERIALS IMPORTED MADRAS
(From 6.12.89 to 12.12.89)

DISPERSE DYES: From China: Nadira Leather Co., 8,000 Kgs., Rs. 3,31,930; Pharmchem Trades, 1,000 Kgs., Rs. 38,105.

SYNTHETIC ORGANIC DYES-TUFF: From Switzerland: 25 Kgs., Rs. 18,600.

MATERIALS IMPORTED BOMBAY
(30.11.89)

ACRYLAMIDE: From Japan: Jaisons Impex Pvt. Ltd., 5,000 Kgs., Rs. 1,27,157; K.K. Research Centre, 15,000 Kgs., Rs. 3,81,468; Paramount Minerals & Chemicals, 1,000 Kgs., Rs. 25,431; From Sagar Paint Co., 3,000 Kgs., Rs. 76,294; Sawari Chemicals Pvt. Ltd., 2,000 Kgs., Rs. 50,863.

ADIPIC ACID: From FRG: Premier Products, 5,000 Kgs., Rs. 1,22,296.

2-AMINO 6-PICOLINE: From Switzerland: Ranbaxy Labs Ltd., 2,000 Kgs., Rs. 3,72,992.

ANILINE OIL: From FRG: Bayer India Ltd., 18,940 Kgs., Rs. 4,21,144.

AROMATIC CHEMICALS: From Switzerland: Oriental Aromatics, 170 Kgs., Rs. 42,644; The Tata Oil Mills Co. Ltd., 500 Kgs., Rs. 1,99,658.

BISPHENOL A: From Belgiu Inter Polymers Ltd., 16.65 M Rs. 4,48,271.

BISPHENYL CARBOXYLAMI PHENYL SULPHIDE: From UK: S keya Chemicals Pvt. Ltd., 5,000 K Rs. 4,90,391.

N-BUTENE: From FRG: IP 37.46 MTs., Rs. 9,17,914.

BUTYL ACRYLATE: From Jap PDI Chemical Inds. Ltd., 14,400 K Rs. 4,35,610.

N-BUTYRALDEHYDE: Fro FRG: Marigold Coatings, 1,500 K Rs. 31,686.

BUTYROLACTONE: From U May & Baker India Ltd., 200 Kg Rs. 22,035.

CALCIUM SILICIDE: From Braz Greaves Foseco Ltd., 3,000 Kg Rs. 81,385.

D-CAMPHOR SULPHONI ACID: From France: Wockhardt Ltd 2,000 Kgs., Rs. 4,06,899.

CAPROLACTAM: From Belgium The Baroda Rayon Corp. Ltd., 28 MTs., Rs. 6,74,020; From Netherlands Century Enka Ltd., 255 MTs Rs. 77,38,719; Nirlon Synthetic Fibre & Chem. Ltd., 306 MTs., Rs. 9,28,643

CARBOFURAN TECH. (MIN 75%): From Japan: Pesticides Indi Ltd., 7,200 Kgs., Rs. 17,81,733.

2-CYANO PYRAZINE: From Japan: Organics Pvt. Ltd., 4,000 Kgs. Rs. 22,08,297; Vista Organics Pvt. Ltd. 4,000 Kgs., Rs. 22,08,297.

CYCLOPROPYLAMINE: From FRG: Cadila Labs Ltd., 150 Kgs. Rs. 1,93,450.

DIETHYLENE GLYCOL: From Taiwan: Ganalax Trading & Finance Pvt. Ltd., 360 MTs., Rs. 3,54,002.

DIETHYLENE TRIAMINE PENTA ACETIC ACID: From UK: May & Baker India Limited, 400 Kgs., Rs. 52,309.

DIMETHYL ACETAMIDE TECH.: From USA: J.K. Synthetics Ltd., 70,218 Kgs., Rs. 15,99,894.

DIPHENYL OXIDE: From China: Gadavi Inds., 14,000 Kgs., Rs. 3,79,774.

ETHYL CHLOROFORMATE: From FRG: Glaxo India Ltd., 400 Kgs., Rs. 19,923.

ETHYL ORTHOFORMATE: From Japan: Ranbaxy Labs Ltd., 2,160 Kgs., Rs. 3,02,123.

GAMMA FERRIC OXIDE: From USA: Letape India Pvt. Ltd., 4,989.57 Kgs., Rs. 1,22,661.

HEPTACHLOR TECH.: From USA: Pesticides India, 16,666 Lbs., Rs. 16,88,158.

HYDROGEN PEROXIDE 50%: From Taiwan: Excell Inds. Ltd., 31.92 MTs., Rs. 3,16,588.

8-HYDROXYQUINOLINE: From France: Kirti Chemicals, 1,500 Kgs., Rs. 3,07,373.

IODINE CRUDE 99.5% MIN.: From China: Calibre Chemicals Pvt. Ltd., 2,000 Kgs., Rs. 6,35,781; L.B. Fine Chemicals Pvt. Ltd., 3,000 Kgs., Rs. 9,53,670.

MERCURY PURE MIN. 99.99%: From Turkey: L.S. Chemicals & Pharm., 50 Nos., Rs. 87,353.

METHACRYLAMIDE: From Japan: Maparna Chemical Inds. Ltd., 240 Kgs., Rs. 23,397.

METHYL CYANOACETATE: From Japan: Colour Chem Ltd., 1,000 Kgs., Rs. 99,264.

METHYL DICHLORO ACETATE: From Japan: Narlac Chemicals, 2,000 Kgs., Rs. 72,820.

METHYL ISOBUTYL KETONE: From Italy: M.J. Exports Ltd., 13.2 MTs., Rs. 2,28,270.

MOLYBDENUM TRIOXIDE: From UK: Anupam Colours & Chem Inds., 600 Kgs., Rs. 83,414.

MONOETHYLENE GLYCOL: From Korea: Century Enka Ltd., 1,000.403 MTs., Rs. 1,29,25,555; From Saudi Arabia: Orkay Silk Mills Ltd., 500.251 MTs., Rs. 65,65,178.

NOVALDIAMINE: From FRG: Lakme Ltd., 4,785 Kgs., Rs. 16,81,086.

ORTHO AMINO PHENOL: From France: Voltas Ltd., 31,500 Kgs., Rs. 24,49,525.

PARAFORMALDEHYDE: From Spain: Greaves Foseco Ltd., 5,000 Kgs., Rs. 41,114.

PERCHLOROETHYLENE: From FRG: Shilpa Intl., 18,480 Kgs., Rs. 1,48,823; From Italy: Bharat Chemicals & Paints Inds., 18.48 MTs., Rs. 1,40,991.

D(-)ALPHA PHENYL GLYCINE CHLORIDE HCl: From Netherlands: Armour Chemicals Ltd., 5,775 Kgs., Rs. 20,89,815.

PHOSPHOROUS ACID: From FRG: Ester India Ltd., 675 Kgs., Rs. 87,353.

PIVALOYL CHLORIDE: From France: Cepham Labs Ltd., 3,060 Kgs., Rs. 2,02,984.

POLYVINYL ALCOHOL: From Japan: Kalva Chemicals Pvt. Ltd., 17,000 Kgs., Rs. 7,63,784; Marigold Coatings, 2,000 Kgs., Rs. 94,943; From Taiwan: Ballarpur Inds. Ltd., 13 MTs., Rs. 5,28,969.

PROPIONIC ANHYDRIDE: From Japan: Chemifine, 1,080 Kgs., Rs. 45,161.

PROPYLENE GLYCOL: From USA: Kushal Chand Sons, 16,770 Kgs., Rs. 3,47,401; Satyen Chemicals Inds., 17,200 Kgs., Rs. 3,49,934.

SILICON METAL: From China: Baheti Metals & Alloys Pvt. Ltd., 2,000 Kgs., Rs. 3,56,837.

SODIUM CHLORATE: From Spain Kepee Inds., 3,200 Kgs., Rs. 40,148.

SOYA LECITHIN: From FRG: Wockhardt Limited, 1,000 Kgs., Rs. 22,236.

TITANIUM DIOXIDE: From China: Metro Products India, 17.6 MTs., Rs. 4,89,551; From FRG: Asian Paints India Limited, NA, Rs. 4,74,716.

TRIMELLITIC ANHYDRIDE: From USA: Dr. Beck & Company India Limited, 36,000 Lbs., Rs. 6,86,643.

3,4,5 TRIMETHOXY BENZALDEHYDE 99% MIN.: From China: Parag Pharmls. India, 2,000 Kgs., Rs. 7,73,110.

TRIPHENYL PHOSPHINE: From Japan: Ranbaxy Labs Ltd., 2,000 Kgs., Rs. 3,66,209.

2,4 XYLIDINE: From Switzerland: Formokem India Corporation, 1,000 Kgs., Rs. 72,286; M.B. Industrial Corporation, 2,000 Kgs., Rs. 1,44,368.

PLASTIC MATERIALS IMPORTED BOMBAY (30.11.89)

HDPE: From Czechoslovakia: Associated Bros., 12.5 MTs., Rs. 1,32,234; Balaji Enterprises, 7.1 MTs., Rs. 91,484; Poly Films Inds., 33 MTs., Rs. 4,39,442; From Saudi Arabia: A1 Art, 99 MTs., Rs. 16,49,744; Calcutta Rope Stores, 34,300 Kgs., Rs. 4,12,884; Fortuna Agencies, 5,145 Kgs., Rs. 6,67,302; Klowin Polymers Ltd., 49.5 MTs., Rs. 5,74,873; Mayuri Packs Pvt. Ltd., NA, Rs. 2,28,888, Pai Real Estates, 49.5 MTs., Rs. 5,74,872; Single Sales Corpn., 49.5 MTs., Rs. 5,74,873; Sunshine Plastic Inds., 24.75 Kgs., Rs. 2,72,750; Triveni Plastic Inds. Pvt. Ltd., 17.15 MTs., Rs. 2,23,888; Poly Art Inds. Pvt. Ltd., 99 MTs., Rs. 11,49,744; From Yugoslavia: Abhishek Corpn., 9 MTs., Rs. 1,16,493.

LDPE: From Saudi Arabia: Shashideep Enterprises, 16.5 MTs., Rs. 1,79,036; From Sweden: Universal Cables Ltd., 21 MTs., Rs. 5,75,826.

LLDPE: From Saudi Arabia: V.P.S.A. Velayutha Nadar Co., 33 MTs., Rs. 3,46,882; From Saudi Arabia: New Plastomers India Limited, 49.5 MTs., Rs. 5,16,126; Puneet Polypack Private Limited, 49.5 MTs., Rs. 5,16,127; Sanghavi Bros., 99 MTs., Rs. 10,23,848.

MDPE: From France: Ifiunik Pharmaceuticals Ltd., 5,500 Kgs., Rs. 80,193.

PVC RESIN: From Korea: Space Age Chem Private Limited, 100 MTs., Rs. 12,76,180; From Mexico: Interplast, 16,650 Kgs., Rs. 2,04,469; Star Oxides & Chemicals Ltd., 83.25 MTs., Rs. 10,08,125.

POLYETHYLENE: From Sweden: Vindhya Telelinks Ltd., 11.75 MTs., Rs. 2,76,162.

POLYPROPYLENE: From Korea: Videocon Intl. Ltd., 31 MTs., Rs. 4,43,731; From USA: Garware Wall Ropes Ltd., 2,64,000 Kgs., Rs. 31,09,802.

POLYSTYRENE: From Korea: Ashoka Enterprises, 17 MTs., Rs. 2,50,103; H. Jitendrakumar & Co., 17 MTs., Rs. 2,53,633; Paresh Plastics, 45.51 MTs., Rs. 7,51,413; Ridhi Plast Pvt. Ltd., 51 MTs., Rs. 7,47,933; Shree Shankar Inds., 34 MTs., Rs. 5,00,204; The Supreme Inds. Ltd., 102 MTs., Rs. 14,57,743; Unilite Plastic Inds., 102 MTs., Rs. 15,03,084.

POLYSTYRENE HIGH IMPACT: From Korea: Xpro India, 85 MTs., Rs. 11,96,114.

STYRENE MONOMER: From Saudi Arabia: Apar Ltd., 210 MTs., Rs. 23,67,646.

DRUG MATERIALS IMPORTED BOMBAY (30.11.89)

DL-METHIONINE USSRP: From USSR: Seva Enterprises, 2,500 Kgs., Rs. 2,04,373.

ERYTHROMYCIN THIOCYANATE: From USA: Chemifine, 988.71 Kgs., Rs. 11,75,067.

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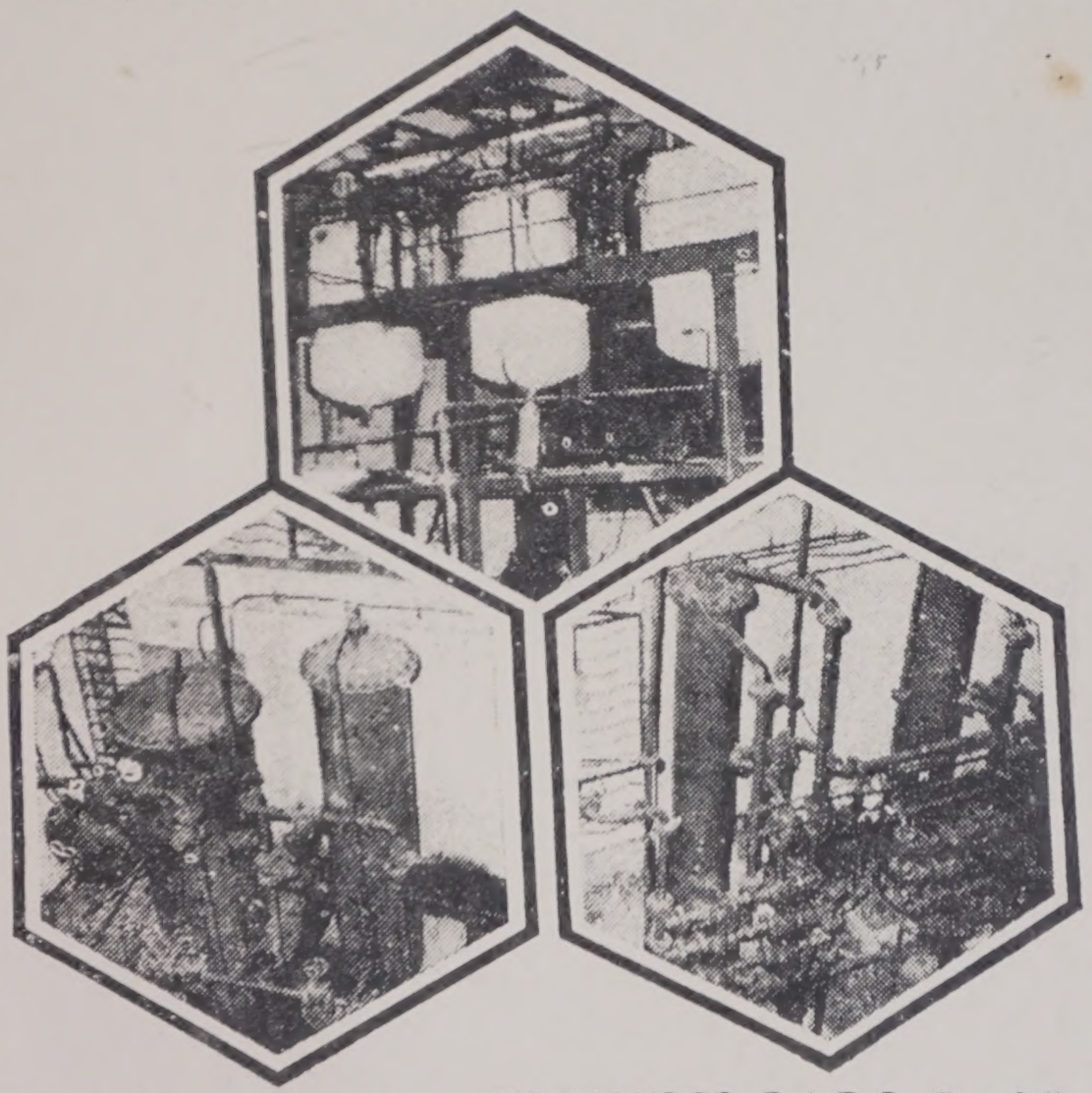

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